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CONTENTS

VOL. IX: 1934-35.

No. I—APRIL 1934

	PAGE.
Venkatadhwari's Account of India: By Mr. C. Sivaramamurthy, B.A., (Hons.) ..	1
The Distribution of Crops in the Vizagapatam District: By Mr. Goteti Jogi Raju Garu. ..	24
The Earth: Its Evolution and Structure: By Mr. C. K. Ananthasubrahmanyam. ..	32
Dr. Fermor's Address on Causes of the Recent Earthquake. ..	43
News and Notes. ..	46
Reviews. ..	49
Books and Journals Received. ..	52

No. 2—JULY 1934.

Valedictory Address to the Teachers' College Teachers' Association: By Miss J. M. Gerrard, M.A. ..	53
Secondary School-Leaving Certificate 1934 Scheme. ..	61
Hints and Comments on the IV Form Syllabus in Geography: By Mr. N. Subrahmanyam, M.A., L.T., F.R.G.S. ..	68
Report of the Tiruvallur Regional Survey Committee. ..	74
The Mettur Dam.	
Evolution of the Scheme. ..	78
History of the Scheme. ..	89
The Purpose of the Scheme. ..	93
Potentialities of the Mettur Area. ..	97
Iron Ores of Salem. ..	104
Manufacture of Chemicals. ..	108
Pulp and Paper Production. ..	110
Exploitation of Oil Seeds Resources. ..	115
Report of the Eighth Annual Meeting of the Madras Geographical Association. ..	119
News and Notes. ..	120
Reviews. ..	122
Books and Journals Received. ..	124

No. 3.—October 1934.

Hill-Climbing in South India: By Mr. N. Subrahmanyam, M.A,. L.T., F.R.G.S. .. 125
The Forests of Southern India: By Mr. A. Wimbush. .. 136
Geography and Education.
Geography under the Dalton Plan: By Helen T. Scudder, M.A., .. 149
Geography Scheme of Work in Forms I to III. .. 156
Special Region for C. Group Geography 1935. .. 158
The Ramayana—As a Guide to the Geography of India: By Dewan Bahadur K. S. Ramaswàmi Sastri. .. 160
Extracts from Periodicals.
School Examinations Surveyed—Geography: By C. B. Thurston. .. 162
Citizenship Through Geography: By W. O. Lester Smith. .. 167
Proposed Extension of the Mysore Railways. .. 170
Excursions:
The Michaelmas tour of the Madras Geographical Association. .. 175
A School Excursion to Karnatgarh. .. 184
The Christmas tour of the Madras Geographical Association. .. 186
News and Notes. .. 188
Reviews. .. 190
Books and Journals Received. .. 193
The Fifth Geographical Conference, Anantapur. .. 194

No. 4.—January 1935.

Fifth Geographical Conference at Anantapur—Presidential Address: By Dr. J. H. Cousins, M.A., D.Litt. .. 197
The Physiography of the Anantapur District: By Mr. P. Sridhara Rao, M.A. .. 209
Geology of the Anantapur District: By Mr. V. D. Krishnaswami, M.A. .. 214
The Meteorology of Anantapur: By Mr. C. K. Ananthasubrahmanyam, M.A. .. 229
Forests of Anantapur District: By Mr. Abdul Hamid Khan, I. F. S. .. 232
Agricultural Geography of the Anantapur District: By Mr. M. V. Srinivasan, B.A., L.T. .. 236

The Economic Geography of the Anantapur District: By Mr. N. R. Subba Iyer, M.A, L.T. .. 240
Urban Geography of Anantapur District: By Mr. R. Dann. .. 247
Population of Anantapur District: By Mr. K. Srinivasa Raghavan, M.A. .. 250
The Geography of Gooty Town: By Mr. V. Koprasachar, B.A., B.Ed. .. 257
Geography of Hindupur: By Mr. K. Nanjundappa, B.A. .. 265
A Note on the Communication Lines of Anantapur District: By Mr. N. Subrahmanyam, M.A., L.T., F.R.G.S. .. 272
News and Notes .. 275
Proceedings of the Fifth Geographical Conference of the Madras Geographical Association, Anantapur Session .. 279
Reviews .. 281
Books and Journals Received .. 285
List of Minimum Equipment for 'C' Group Geography for the S. S. L. C. Course .. 286
List of Minimum Equipment in Geography for the Intermediate Course .. 289

LIST OF MAPS, CHARTS, ILLUSTRATIONS, ETC.

Figure.			Page.
1.	Map of River Cauvery	Facing	78
2.	The Mettur Dam	"	80
3.	Map Showing the Waterspread at F. R. L. 7900	"	82
4.	Layout of Mettur Head Works	"	84
5.	Canal System	"	89
6.	Diagram showing the surface and underground workings in a gold mine	"	177
7.	The Island, the Bluff and the Falls		178
8.	The Falls, Penstokes and Power Station.		179
9.	Reservoir, Penstokes and Turbine		180
10.	The Mettur Dam and Reservoir		182
11.	Map showing Route of the Michaelmas Excursion	Facing	182
12.	Railway Map of South India		196
13.	Physical Map of Anantapur District	Facing	208
14.	Geological Map of Anantapur District	"	216
15.	Monthly March of Maximum Temperature	"	230
16.	Monthly March of Minimum Temperature	"	230
17.	Monthly March of Relative Humidity	"	230
18.	Monthly March of Pressure at Bellary	"	231
19.	Monthly March of Cloudiness	"	231
20.	Percentage of Waste Land, Soils and Irrigated Area	"	244
21.	Population of Anantapur District	"	252
22.	Hindupur Taluk	"	268
23.	Hindupur Town	"	268
24.	Rainfall in Hindupur Taluk for the Year 1934	"	268
25.	Hindupur Municipality:—Birth and Death Rates from 1923	"	268
26.	Map of the Anantapur District, showing Communications	"	272

INDEX OF TOPICS

Page.

Account of India, Venkatadhwari's: By Mr. C. Sivaramamurthy, B.A., (Hons.) .. 1

Address on Causes of the Recent Earthquake: By Dr. Fermor .. 43

Address to the Teachers' College Teachers' Association, Valedictory: By Miss J. M. Gerrard, M.A., .. 53

Agricultural Geography of the Anantapur District: By Mr. M. V. Srinivasan, B.A., L.T. .. 236

Anantapur, The Fifth Geographical Conference: .. 194

Anantapur District, The Physiography of the: By Mr. P. Sridhara Rao, M.A. .. 209

Anantapur District, Geology of the: By Mr. V. D. Krishnaswami, M.A. .. 214

Anantapur, The Meteorology of: By Mr. C. K. Ananthasubrahmanyam, M.A. .. 229

Anantapur District, *Forests of*: *By* Mr. Abdul Hamid Khan, I. F. S. .. 232

Anantapur District, Agricultural Geography of the: By Mr. M. V. Srinivasan, B.A., L.T. .. 236

Anantapur *District*, The *Economic* Geography of the: By Mr. N. R. Subba Iyer, M.A., L.T. .. 240

Anantapur District, Urban Geography of: By Mr. R. Dann .. 247

Anantapur District, Population of: By Mr. K. Srinivasa Raghavan, M.A. .. 250

Anantapur District, A Note on the Communication Lines of: By Mr. N. Subrahmanyam, M.A., L.T., F. R. G. S. .. 272

Anantapur Session, Proceedings of the Fifth Geographical Conference of the Madras Geographical Association .. 279

Annual Meeting of the Madras Geographical Association, Report of the Eighth .. 119

Books and Journals Received 52, 124, 193, 285

"C" Group Geography 1935, Special Region for: .. 158

"C" Group Geography for the S. S. L. C. Course, List of Minimum Equipment for .. 286

Citizenship Through Geography: By Mr. W. O. Lester Smith .. 167
Causes of the Recent Earthquake, Dr. Fermor's Address on. 43
Comments on the IV Form Syllabus in Geography, Hints and: By Mr. N. Subrahmanyam, M.A., L.T., F.R.G.S. 68
Conference, Anantapur, The Fifth Geographical .. 194
Communication Lines of Anantapur District, A Note on the: Mr. N. Subrahmanyam, M.A., L.T., F.R.G.S. .. 272
Conference of the Madras Geographical Association Anantapur Session, Proceedings of the Fifth Geographical .. 279
Crops in the Vizagapatam District, The Distribution of: By Mr. Goteti Jogi Raju Garu .. 24
Distribution of Crops in the Vizagapatam District, The: By Mr. Goteti Jogi Raju Garu .. 24
Dalton Plan, Geography under the: By Helen T. Scudder, M.A. .. 149
Earth: Its Evolution and Structure, The: By Mr. C. K. Ananthasubrahmanyam .. 32
Earthquake, Dr. Fermor's Address on Causes of the Recent .. 43
Economic Geography of the Anantapur District, The: By Mr. N. R. Subba Iyer, M.A., L.T. .. 240
Eighth Annual Meeting of the Madras Geographical Association, Report of the: .. 119
Equipment for "C" Group Geography for the S. S. L. C. Course; List of Minimum .. 286
Equipment in Geography for the Intermediate Course, List of Minimum .. 289
Evolution and Structure, The Earth: Its: By Mr. C. K. Ananthasubrahmanyam .. 32
Evolution of the Scheme, The Mettur Dam .. 78
Examinations Surveyed—Geography School. By Mr. C. B. Thurston .. 162
Excursions .. 175
Excursion to Karnatgarh, A School .. 184
Extension of the Mysore Railways, Proposed .. 170
Exploitation of Oil Seeds Resources, The Mettur Dam .. 115
Fifth Geographical Conference, Anantapur, The: .. 194
Forests of Southern India, The: By Mr. W. A. Wimbush .. 136
Forms I to III, Geography Scheme of Work in .. 156
Forests of Anantapur District. By Mr. Abdul Hamid Khan, I. F. S. .. 232
Fourth Form Syllabus in Geography, Hints and Comments on the: By Mr. N. Subrahmanyam, M.A., L.T., F.R.G.S. .. 68

Geographical Association, Report of the Eighth Annual Meeting of the Madras .. 119
Geography under the Dalton Plan: By Helen T. Scudder, M.A. .. 149
Geography Scheme of Work in Forms I to III .. 156
Geographical Conference, Anantapur, The Fifth .. 194
Geology of the Anantapur District: By Mr. V. D. Krishnaswami, M.A. .. 214
Gooty Town, the Geography of: By Mr. V. Koprasachar, B.A., B.Ed. .. 257
Hill-Climbing in South India: By Mr. N. Subrahmanyam, M.A., L.T., F.R.G.S. .. 125
History of the Scheme, The Mettur Dam .. 89
Hints and Comments on the IV Form Syllabus in Geography: By Mr. N. Subrahmanyam, M.A., L.T., F.R.G.S. .. 68
Hindupur, Geography of: By Mr. K. Nanjundappa, B.A. .. 265
India, Venkatadhwari's Account of: By Mr. C. Sivaramamurthy, B.A. (Hons.) .. 1
Intermediate Course, List of Minimum Equipment in Geography for the: .. 289
Iron Ores of Salem, The Mettur Dam .. 104
Journals received, Books and 52, 124, 193, 285
Karnatgarh, A School Excursion to .. 184
List of Minimum Equipment for "C" Group Geography for the S. S. L. C. Course .. 286
List of Minimum Equipment in Geography for the Intermediate Course .. 289
Madras Geographical Association, Report of the Eighth Annual Meeting of the .. 119
Meeting of the Madras Geographical Association, Report of the Eighth Annual .. 119
Manufacture of Chemicals, The Mettur Dam .. 108
Mettur Dam, The .. 78
Meteorology of Anantapur, The: By Mr. C. K. Ananthasubrahmanyam, M.A. .. 229
Michaelmas Tour of the Madras Geographical Association, The: .. 175
Minimum Equipment for "C" Group Geography for the S. S. L. C. Course, List of .. 286
Minimum Equipment in Geography for the Intermediate Course, List of .. 289
Mysore Railways, Proposed Extension of the .. 170

News and Notes 46, 120, 188, 275
Note on the Communication Lines of Anantapur District, A: Mr. N. Subrahmanyam, M.A., L.T., F.R.G.S. .. 272
Physiography of the Anantapur District, The: By Mr. P. Sridhara Rao, M.A., .. 209
Potentialities of the Mettur Area .. 97
Population of Anantapur District: By Mr. K. Srinivasa Raghavan, M.A. .. 250
Presidential Address, Fifth Geographical Conference at Anantapur: By Dr. J. H. Cousins, M.A., D.Litt. .. 197
Proceedings of the Fifth Geographical Conference of the Madras Geographical Association, Anantapur Session .. 279
Proposed Extension of the Mysore Railways .. 170
Purpose of the Scheme, The Mettur Dam .. 93
Pulp and Paper Production, The Mettur Dam .. 110
Ramayana—As a Guide to the Geography of India, The: By Dewan Bahadur K. S. Ramaswami Sastri .. 160
Regional Survey Committee, Report of the Tiruvallur .. 74
Report of the Tiruvallur Regional Survey Committee .. 74
Report of the Eighth Annual Meeting of the Madras Geographical Association .. 119
Reviews 49, 122, 190, 281
S. S. L. C. Course, List of Minimum Equipment for "C" Group Geography for the .. 286
Secondary School Leaving Certificate 1934 Scheme .. 61
School-Leaving Certificate 1934 Scheme, Secondary .. 61
Scheme, Secondary School-Leaving Certificate 1934 .. 61
School Examinations Surveyed—Geography: By Mr. C. B. Thurston .. 162
School Excursion to Karnatgarh, A .. 184
Scheme of Work in Forms I to III, Geography .. 156
South India, Hill-Climbing in: By Mr. N. Subrahmanyam, M.A., L.T., F.R.G.S. .. 125
Southern India, The Forests of: By Mr. A. Wimbush .. 136
Special Region for "C" Group Geography, 1935 .. 158
Structure, The Earth and Its Evolution and: By Mr. C. K. Ananthasubrahmanyam .. 32
Syllabus in Geography, Hints and Comments on the IVth Form: By Mr. N. Subrahmanyam, M.A., L.T., F.R.G.S. 68
Teachers' Association, Valedictory Address to the Teachers' College: By Miss J. M. Gerrard, M.A. .. 53

Tiruvallur Regional Survey Committee, Report of the .. 74
Tour of the Madras Geographical Association, The Michaelmas .. 175
Urban Geography of Anantapur District: By Mr. R. Dann. 247
Valedictory Address to the Teachers' College Teachers' Association: By Miss J. M. Gerrard, M.A. .. 53
Vizagapatam District, The Distribution of Crops in the: By Mr. Goteti Jogi Raju Garu .. 24

INDEX OF AUTHORS

Abdul Hamid Khan	.. 232
Ananthasubrahmanyam, C. K.	32, 229
Cousins, J. H. Dr.	.. 197
Dann, R.	.. 247
Fermor, Dr.	.. 43
Gerrard, J. M.	.. 53
Jogi Raju Garu, G.	.. 24
Koprasachar, V.	.. 257
Krishnaswami, V. D.	.. 214
Lester Smith, W. O.	.. 167
Nanjundappa, K.	.. 265
Ramaswami Sastri, Dewan Bahadur, K.S.	.. 160
Scudder, Helen T.	.. 149
Sivaramamurthy, C.	.. 1
Sridhara Rao, P.	.. 209
Srinivasan, M. V.	.. 236
Srinivasa Raghavan, K.	.. 250
Subba Iyer, N. R.	.. 240
Subrahmanyam, N.	68, 272
Thurston, C. B.	.. 162
Wimbush, A.	136

PRESS MADRAS,

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Venkatadhwari's Account of India

A meeting of the Association was held at 5-30 P.M. on Friday the 23rd March 1934 at the University Department of Geography, Wesley College, Royapettah, when **Mr. C. Sivaramamurthy,** B.A. (Hons.), University Research student in Sanskrit, read a paper on **"Venkatadhwari's Account of India."**

M.R.Ry. Diwan Bahadur K. S. Ramaswami Sastri Avl., B.A., B.L., Retired District and Sessions Judge, who presided on the occasion, introduced the lecturer as a talented young artist who interpreted Sanskrit literature through creative art.

(The following paper was then read and discussed.)

A rambling propensity is not an uncommon trait with an inquisitive person; and a traveller it is who is generally the distributor of a particular kind of knowledge— a sympathetic study of the world and its inmates—highly instructive without the irksome office of burning the midnight oil. Topics of travel and adventure are prone to kindle the imagination of ramblers and egg them on to further trudging. The halo of mysterious piety enlacing places deemed divine attracts the steady gaze of many a pilgrim religiously disposed. Not very rarely it happens that the pilgrim is profusely gifted by the poetic muse and pours forth in elegant verse a record of his peregrinations ablaze with fiery detail and throbbing with personal moralisings.

A student of Venkatadhwari cannot be blind to this aspect in his work which is but an account of the poet's own travels described as that of a couple of Gandharvas[1] who

1. Visvagunadarsa (Nirnayasagar Edn.), p. 4, sl. 5.

"Placed on high above the storm's career,
Look downward where a hundred realms appear;
Lakes, forests, cities, plains extending wide,
The pomp of Kings, the shepherd's humbler guide."

Representing two distinctly different types of humanity, Krisanu adheres to that party of men who answer in the affirmative to the question :

"When thus creation's charms around combine,
Amidst the store should thankless Pride repine,"

Visvavasu representing the class :

"Wiser he whose sympathetic mind
Exults in all the good of all mankind."[2]

The poet though professing to give out a detailed description of the world does not touch on a single spot outside India; and even in giving an account of places within that land his idea of territory beyond his familiar area happens to be vague and indistinct. But then religious anecdotes and his mastery of the languages carry him a great way and he escapes to a great extent the scrutinizing eye of the critic who might question why he attempts those descriptions with an insufficiency of material. All idea of distance and travel are set at naught in his description of the northern Indian tour. The aerial car flies hither and thither helter-skelter. Coming to South India, there is a smooth and methodical course adopted. The date of the poet being the 17th century the description of India that he gives is of that period.

The first of a list, a place of which the poet has only a superficial knowledge is Badarikasrama. Here Lord Vishnu is believed to stay with the sole intention of helping his devotees.[3] In the impudent sarcasm of Krisanu we find a true description of the cold breezes of the Himalayas on whose monster ice-heaps is situated this sacred spot ; no wonder the pilgrims quail at the idea of a holy bath in such a chilling atmosphere.[4] Badarikasrama is the same as Modern Badrinath, " a place of the main Himalaya range in Garhwal

2. Visvagunadarsa, p. 4, sl. 6.
3. *Ibid.*, p. 29, sl. 33.
4. Ibid., p. 30, sl. 34.

district, reaching to the height of 23,210 feet above the sea. From the glaciers on its sides, the Alakananda river and many of its tributaries take their rise. On one of its shoulders, at an elevation of 10,400 feet, and 56 miles north-east of Srinagar, stands a shrine of Vishnu, which also bears the name of Badrinath. The existing temple is more noteworthy for its religious importance than for any architectural pretensions.

Below the shrine a sacred tank stands on the hill-side, supplied from a thermal spring by means of a spout in the shape of a dragon's* head. Pilgrims of both sexes bathe in the holy pool.[5]

The next is Ayodhya on the banks of Sarayu.[6] The yupastambhas on the river side are only the poet's fancy and the information that we get here is nothing new. This ancient town and railway station is 4 miles from Fyzabad and situated on the right bank of the Gogra or Sarju river.[7]

Not very far off is the sacred river Ganges, whose mythical origin from Vishnu's feet and descent from Siva's locks forms a suitable subject for the poet's description.[8] Her confluence with Saraswati and Yamuna is also referred to.[9] On the banks of the river is situated the famous city of Varanasi or Benares, abounding in majestic mansions.[10] The people of this place are pictured as very rich and affluent ever riding excellent horses and elephants.[11] Visvavasu's appreciation of the good features of the place kindles the criticising spirit of Krisanu, who straightaway begins to give out a catalogue of its defects. This gives us an insight into the life of that city about that particular period. The poet confesses indirectly, through the mouth of Krisanu, his disapproval of the people of the place who after bathing in the sacred streams wear clothes brought by washerman, wander about in the streets, touch mlecchas (Europeans or Muslims), take meal even without taking a bath

* Makara.
5. The Indian Companion—Badrinath.
6. Visvagunadarsa, p. 32, sl. 36.
7. The Indian Companion—Ajodhya.
8. Visvagunadarsa, p. 51, sl. 76.
9. Ibid., p. 53, sl. 80.
10. Ibid., p. 54, sl. 82.
11. Ibid., p. 55, sl. 83.

again and with all not a blush creeping to their cheeks! [12] His orthodox sentiment is wounded when he sees Sastras neglected and the military profession resorted to, when water brought by Sudras serves for bathing, drinking and worship! When intercourse with all sorts of people and walking close to a Chandala in the streets is considered no folly! [13] He can't but wonder at the curious nature of a people who partake of food come under the purview of Mlecchas and dogs in the company of low and vile men ignorant of even a syllable of the Veda.[14]

The author is further disgusted with the people of that place who in their eagerness for wealth go away on travel wasting their prime of life in trading abroad, thus spoiling the youth of their lovely wives only to return home with grey hairs on their head.[15]

Now comes Visvavasu rebuking his friend for his criticising attitude and shows him that resorting to the military profession and following the Mussalman kings is no sin in the case of these amiable men who do all this only to protect the 'temples of their gods.' [16] Here through the mouth of Visvavasu the poet voices forth his appreciation of the good element even in people opposed to orthodoxy and thus reveals his tolerant spirit. In the appreciative speech of Visvavasu there are two interesting facts. The poet feels gratified that the people of the place avoid eating paryusita (cooked rice of the previous day preserved in water) as is the custom in the south, and cook and dine only in a place well smeared with cowdung.[17]

After an almost Pauranic description of the ocean Jagannath is taken up as a religious place of importance on the sea coast.[18] The peculiar custom of the place, that of receiving the lord's prasada from the hands of people of a low caste[19] is referred to by the poet who does not forget to mention the wooden nature of the idol

12. Visvagunadarsa, p. 60, sl. 90.
13. Ibid., p. 59, sl. 89.
14. Ibid., p. 60, sl. 91.
15. Ibid., p. 61, sl. 92.
16. Ibid., p. 63, sl. 96.
17. Ibid., p. 66, sl. 101.
18. Ibid., p. 72, sl. 112.
19. Ibid., p. 72, sl. 113.

of the place.[20] The celestial chariot proceeds a long distance and now sights the land of Guzerat. The people are of a fashionable nature and delight in chewing highly perfumed betel leaves and nuts, wearing excellent clothes on their bodies fully ornamented and scented.[21] This is so not in the case of men alone. Those of the other sex are not a whit behind in their beauty or fashion. Their fair complexion and vermillion lips are enough to excite youths.[22] The criticising attitude of Krisanu cannot but blame the mercantile nature of the people who wander about in distant lands carrying on trade in gem leaving their fair wives to pine away in their homes.[23]

Again traversing a long way Jumna is reached and the river's associations with Krishna are referred to. Going again a considerable distance the car soars high over the Maharashtra territory. From the sneers of Krisanu we gather some account of the Maharashtras of the day. The Brahmins of the place, generally village karnams by profession, are men of varied activity having scarcely any time to perform daily ablutions at the proper time.[24] Upanayanas and marriages are performed at wrong times only to enjoy the mirth of the occasion and the young students learn the Yavana Script (Urdu) to the detriment of Vedic lore.[25] No wonder they are capable of speaking only the common language of the country and keep silent unable to utter manthras in a language Greek and Latin to them.[26] Their profession necessarily turns out to be that of serving the Yavana (Mussalman) king, and what is more—pilfering by balancing accounts in villages, thus duping their ignorant masters.[27] But then the generous nature of Visvavasu gives us the better side of the picture when he points out that if not for the civil and military profession followed by the Maharashtra Brahmins the land would long ago have been overridden by the Yavanas (Muslims).[28] It is noteworthy and important to learn that the military capacity of the men is stressed here.[29] This information is of particular interest since the Maharashtras of the poet's day were sturdy

20. Visvagunadarsa, p. 73, sl. 114.
21. Ibid., p. 74, sl. 115.
22. Ibid., p. 74, sl. 116.
23. Ibid., p. 75, sl. 117.
24. Ibid., p. 84, sl. 133.
25. Ibid., p. 85, sl. 134.
26. Ibid., p. 85, sl. 135.
27. Ibid., p. 86, sl. 136.
28. Ibid., p. 88, sl. 141.
29. Ibid., p. 90, sl. 144,

ing the sectarian mark on their foreheads, and is exported for this purpose as far as Benares.

Sighting Rajatasanupura, its association with Anandatirtha (Madhwa) is referred to by Visvavasu.[41] This the birth place of Anandatirtha being peopled mostly by Madhwas, Krisanu takes the opportunity to criticise that community. The late performance of Sandhya by the generality of the Madhwas is only a minor sin[42] considering the faults of their guru who wanders about the country in a palanquin hankering after wealth wedded as he is to the life of an anchorite free from worldly desires.[43] That even the learned of the community should believe in relief from sin by the two acts, quite against scripture which prescribes an immediate bath at the sight of an ascetic on a vehicle and Chandrayana prayascitta on partaking of his food, is really a great wonder to this critic.[44] He deplores the pathetic life of ragged householders being fed in palatial stone-hewn monasteries by muslin clothed ascetics travelling on palanquins.[45] Their neglect of Vedas and importance attached to sastras is also a subject of criticism.[46] Krisanu heartily laughs at their habit of using flour made *pasu* in the place of a live one and funnily remarks that their household fire being already polluted by their neglect of sacrifice on Ekadesi days the use of a living animal is a mere wasteful cruelty. But then Visvavasu explains away all these foibles with a generous outlook and appreciates their great faith in Narayana and their fasting on Harivasa.[47, 48]

In the fourth volume of the collected works of R. G. Bhandarkar,[49] we have the information, " According to the Madhwavijaya or the history of the triumphs of Madhwa, by Narayana, the son of Trivikrama, there was in the town of Rajathapitha a family known by the name of Madhyageha. Madhwa's father was called Madhyagehabhatta, and under this in a footnote there is an extract quoted from the Imperial Gazeteer "Kallianpur in the Udipi taluka of the district of South Kanara is stated to be the birth-place of Madhwa.[50]

41. Visvagunadarsa, p. 104, sl. 176.
42. Ibid., p. 104, sl. 177.
43. Ibid., p. 105, sl. 178.
44. Ibid., p. 105, sl. 179.
45. Ibid., p. 106, sl. 180.
46. Ibid., p. 106, sl. 181.
47, 48. Ibid., p. 107, sl. 183.
49. The Collected Works of R. G. Bhandarkar, vol. iv, p. 82.
50. Imp. Gaz., vol. xiv, p. 314.

It was probably the same as the Rajathapitha of the Madhwavijaya. The commentator of Visvagunadarsa gives the vernacular name for Rajapithapura as Suvanur. So then it is a question whether this same Kallianpur is Suvanur in the vicinity of Udipi wherein "there are eight maths (Hindu Monastaries); and the management of the temple, which is very ancient and largely endowed is held by the heads of these maths in rotation for two years each."[51] Though the customs that Krisanu criticises persist even to-day one would do well to view them from the standpoint of Visvavasu who sympathises with the gurus for their inability to walk long distances and excuses their collection of money in view of their liberality in feeding householders with food offered to God which ceased on that account to be an ascetic's food.[52]

Coming to the Sesha Saila (Tirupathi) the divine pilgrims describe the wild scenery on the hill which abounds in various trees, caves, streams and such others of the sylvan element.[53] The peculiarly large number of monkeys that swarm the mountain is specially noted by the poet.[54] The legends connected with the place are not forgotten. The Lord's begging for a drop of water in the wood, his carrying mud to help a man digging a deep well, his wearing a garland of earthen flowers are all stated.[55] Some of the miracles of the place are the deaf man hearing the song of the mute, the maimed one writing it for the blind man to see, the cripple climbing up the cliff and the barren woman big with child.[56] But all the same the Lord does not escape the caustic tongue of Krisanu. He questions why Venkatesa terrifies people forgetting to pay him the promised amount, even after attaining their desire and extorts from them interest with the capital.[57] The custom of people praying to god Venkatesa for a particular thing and promising him this and that on their success in getting it: their usual forgetting the promised thing in their joy on their success, and the Lord's threatening in miraculous ways (by means of *avesams*), and the final payments with additions is no unusual thing even to-day.

51. Indian Companion.
52. Visvagunadarsa, p. 108, sl. 184; p. 109, sl. 186.
53. Ibid., p. 112, sl. 192.
54. Visvagunadarsa, p. 119, sl. 205.
55. Ibid., p. 114, sl. 197.
56. Ibid., p. 118, sl. 204.
57. Ibid., p. 114, sl. 196.

To the south of Tirupathi hill there are wild forests thickly populated by various wild beasts, robbers and hunters.[58] Even to-day when the ravaging hand of man has worked the ruin of many a stately woodland tree we find not a few rich forests covering the slopes of the Seshachalam hills.

Further south is situated Ghatikachala (Sholingar) with Narasimhaswami on the hill top.[59] From here the chariot proceeds to Viksharanya. The lake of this place goes by the name of Hrittapanasini and is reputed to relieve men of their miseries; on its bank is situated Lord Viraraghava worshipped by sage Salihotra in times of yore. The place is also honoured by the arrival of a river called Kusasthali.[60] This Viksharanya is the same as modern Tiruvellore. Under the head Tiruverrul Mr. P. V. Jagadisa Aiyar has this information—"(modern Tiruvellore near Madras). This is also called Vedharanniam. Sage Salihotra worshipped the Lord Viraraghava here."[61] Vesharanniem is perhaps a misprint for Viksharanya. Krisanu refers to the Venkatesa like habit of Viraraghavaswami,[62] to whom not a few devotees pray to attain their own ends. The various prarthanas like dissolving jaggery in the tank of the temple, Hrittapanasini, are as usual to-day as ever.

The aerial car now leaves for Bhutapuri which is the same as modern Sriperumbudur. This is the birth-place of Ramanujacharya who gave to the world the essence of the Upanishads in the form of his polemical treatises.[63] The very mention of the name of this great philosopher is enough to loosen the stinging tongue of Krisanu who gives us a catalogue of the defects of the followers of Ramanuja. These people peculiarly known as *Tengales* are particularly scrupulous in avoiding eating in the company of other sects and more often than not exclude even those of their own community from the privileges of interdining.[64] Another feature about these people that annoys Krisanu is their peculiar fondness towards Tamil Prabandhas to the utter neglect of the Scrip-

58. Visvagunadarsa, p. 120, l. 3-4; p. 121, sl. 208.
59. Ibid., p. 122, l. 6, sl. 211.
60. Ibid., p. 125, sl. 219.
61. South Indian Shrines, p. 539.
62. Visvagunadarsa, p. 126, l. 1-2.
63. Ibid., p. 127, sl. 223.
64. Ibid., p. 130, sl. 229.

tures in the sacred tongue (Vedas) which attitude our amiable critic compares to the foolishness of a man desirous of milk going in quest of a cowherd's hut even when standing on the shores of the milky ocean.[65] He is further displeased with them for neglecting the five daily sacrifices laid down in scriptures, for confusing the ignorant with the Tamil Prabandhas, for abusing sacrifices in general, for very often obstructing the worship of the Lord (by sectarian quarrels), for abusing the good and great, for discontinuing Sraddha ceremonies and for making ascetics bow to householders.[66] He impeaches them for the high offence of neglecting the sounding of the bell at the performance of worship and for depreciating the divine worth of Sri, the mother of the three worlds and for taking an idle pleasure in drinking the water with which they had washed their feet.[67] Their neglect of Tarpana, etc., on holy occasions like the eclipse and Samkramana with the impudent remark that all that is Kamya Karma irritates our critic:[68] as also does their hypocritical behaviour and counterfeited humility coupled with their dexterity in confusing even wise men by their lying tales of a thousand traditions.[69] Their narrow-mindedness exhibited in refusing to bathe in the Ganges on account of its association with the Universal Dancer, in the sea because of its salty nature and in the avoiding of *pancagavya* in view of the nature of its origin is not a little displeasing to Krisanu.[70] The so-called acharyas of the community who live on the money given them by rogues, bandits and such other low men who plunder and kill people on the way in hills and forests, getting themselves initiated by them into the mysteries of manthras after the regular marking of the discus on their bodies do not escape his eye.[71] The mere accepting of one as a guru simply because of his birth in a particular family of hereditary gurus, in spite of his utter stupidity is deeply bemoaned by the critic[72] who feels quite sure that the thoroughly illiterate acharyas of these thieves and hunters can in no way help either themselves or their disciples. Visvavasu now comes forward to argue on behalf of these people of shattered reputation and elo-

65. Visvagunadarsa, p. 130, sl. 230.
66. Ibid., p. 131, sl. 231.
67. Ibid., p. 131, sl. 232.
68. Ibid., p. 132, sl. 233.
69. Ibid., p. 132, sl. 234.
70. Ibid., p. 133, sl. 237.
71. Ibid., p. 144, sl. 249.
72. Ibid., p. 146, sl. 253,

quently pleads for the Tamil tongue in which the Prabandhas are written. He questions as to how a language with its grammar written by the sage Agastya is inferior to that which owes its systematised grammar to the sage Panini.[73] The Prabandhas, he holds, are great in three ways first, because of their being in a language which was systematised by Agastya, second, because of the composers of the same being Satagopa and others and third because of their being read by Ramanuja and others.[74] The reclamation of the thieves by the guru through mudradana, etc., he compares to the purifying agency of the Ganges.[75] This section is an important one in view of the fact that we get ample information about the Tengale sect of the Sri Vaishnavas. " Ramanuja founded no less than 700 colleges and sought to secure the permanence of his religious system by establishing 89 hereditary guruships. Those at Conjeevaram, Srirangam, Rameswaram, Totadri and Ahobilam still remain." [76] It is this hereditary sort of guruship about which the poet grumbles.

The divine dyad now proceeds to the famous pond Kairavini on whose brink is situated the temple of Parthasarathi.[77] And Krisanu does not feel happy without finding out something to detract from the greatness of the place. For him the very situation of a town in the vicinity thickly populated by Huns (Europeans) notorious for their lack of good traits is itself a sufficient blemish for the temple.[78] He grows vexed at the immense wealth of the cruel Hunas who are *saucatyagins*[79] and condemns Brahma's generosity which in his opinion is quite out of place. But Visvavasu gives us a better picture of these men who in his opinion never rob another of his wealth by force, never speak an untruth, do wonderful things and punish culprits according to law.[80] What these wonderful things are is difficult to understand. The commentator takes those for glass vessels and spectacles. We know from History that the English merchants brought articles of luxury to the East and took back home spices and precious metals. Some of these articles

73. Visvagunadarsa, p. 136, l. 10-11.
74. Ibid., p. 137, sl. 245.
75. Ibid., p. 148, sl. 258.
76. Indian Companion—Sriperumbudur.
77. Visvagunadarsa, p. 149, sl. 260.
78. Ibid., p. 150, l. 3-5.
79. Ibid., p. 150, sl. 262, 263.
80. Visvagunadarsa, p. 151, sl. 264.

of luxury might have been the wonderful things alluded to by the poet. The coach that was presented to Jehangir by Sir Thomas Roe was a novelty in India and the poor monarch sat, it is said, in the wrong place on the top of the carriage. Such rare specimens might contribute to the wonder of the people regarding them. Regarding the Europeans' just collection of money and punishing culprits according to their crimes we have some information in the Encyclopaedia Britannica: "From a simple trading company, it grew under his (Charles II) reign into a great chartered company to use the modern term with the right to acquire territory, coin money, command fortresses and troops, form alliances, make war and peace and exercise both civil and criminal jurisdiction." [81] It is the last function of the company that the poet refers to and the Hunas are the famous merchants of the East India Company settled in Madras very near Tiruvallikkeni which takes its name from the famous Kairaveni pond of which mention is made by the poet. The reference to the wealth of the Hunas is no exaggeration when we see that "the great prosperity of the company under the Restoration, and the immense profits of the Indian trade, attracted a number of private traders, both outside merchants and dismissed or retired servants of the company, who came to be known as interlopers." The cruel rapacity of these wandering merchants of that time is no untruth as we have the explicit statement of the Encyclopaedia Britannica which, describing Sir John Hawkins as "greedy, unscrupulous and rude," says that "his morality was that of the average stirring man of his time, whether in England or elsewhere." One would not wonder at the poet's disgust for the Hunas after a perusal of Burke's "Impeachment of Warren Hastings" which gives us an insight into the culpable character of the company's servants.

Proceeding five yojanas* to the west, the car sights Canchi.[82] This accuracy of distance between Triplicane and Conjeevaram is striking. The first to be taken up is Vishnu Canchi where the Lord is stationed on Hasti Saila.[83] To the south of this place flows a river called Vegavathi.[84] This river is said to have been an obsta-

81. Encyclopaedia Britannica—East India Company.
* A yojana is roughly eight or nine miles.
82. Visvagunadarsa, p. 152, sl. 265.
83. Ibid., p. 152, sl. 265.
84. Ibid., p. 152, l. 8.

cle in the way of Brahma performing a sacrifice upon which Lord Varada is reported to have stopped its course.[85] The Hasti Saila is a small elevated mound on which the Lord's shrine is stationed and a visit to the temple would elucidate the point. The river Vegavathi, though almost on the point of disappearance yet lingers in the shape of a dirty rivulet with a cremation ground adjacent to it. The poet now goes to minute details and gives us some more information about the place. The name of the divine consort of Varadaraja, Komalavalli, is given out.[86] The famous tank Anantha Saras in the temple, in whose vicinity is situated Punya Koti Vimana the northern portion of which is honoured by the presence of the Lord and Kalyana Koti Vimana the abode of Lakshmi are mentioned as also are the minor sanctuaries of Rama, Yadava and Varahamurti.[87] In the Indian Architecture it is stated that "the vimana of the temple is known by the name of punya-koti vimanam and its construction is ascribed to the Vijayanagar King, Krishna Deva, of the early part of the 16th century A.D." In the same book Anantha Saras is referred to as the Teppakulam. The poet does not forget to mention two more tanks Pushya and Karindrasaras to the north and south of the temple respectively,[88] and also the God Dipaprakasa situated somewhat further away to the west of the temple.[89] Karindrasara is the tank very near the shrine of the Goddess Ashtabhuja.[90] The temple of Dipaprakasa is a minor one and he is known as Vilakkoli perumal. In the Indian Architecture we have the information that "of the temples dedicated to Vishnu, Attiyur Varadaraja, Parameswara Vinragar, Vaikuntha Perumal, Tiruppadagan Pandavaperumal, Tirutanka Vilakkoli Perumal, Attabuyagaran Astabhuja and Uraghan Ulagalanda Perumal are considered important." It is to those last four deities that Venkatadhwari attaches some importance as also to one Narasimha Swami on the banks of Vegavathi.[91] The gopura of Trivikramaswami is mentioned as a tall one.[92] This Trivikrama is the same as the famous Ulagalantha Perumal in a shrine west of Kamakshi Amman temple. The poet mentions Pan-

85. Visvagunadarsa, p. 157, sl. 276.
86. Ibid., p. 158, sl. 278.
87. Ibid., p. 156, sl. 275.
88. Ibid., p. 161, sl. 284.
89. Ibid., p. 162, sl. 286.
90. Ibid., p. 161, sl. 285.
91. Ibid., p. 170, sl. 301.
92. Ibid., p. 172, sl. 317.

davadutaswami when he describes at length Lord Ekamreswara since the temple of the former is to the west of Ekamreswara Sannadhi street.[93] Vishnu Canchi having been the famous abode of the erudite scholar, poet and reformer Venkatanatha, the poet takes the opportunity to praise him as also the Vaidic and Sastraic nature of his followers who happen to be the very contrast of the Tengale community.[94] That Canchi was a seat of learning is clearly stated by the poet even in the very beginning of the description of Canchi.[95]

Coming to Siva Canchi the most important deity of the place, Kamakshi, is praised as the ornament of the town and her too famous beauty is emphasised.[96] Her consort, Ekamreswara, here appeared to the world under a mango tree on the banks of the river Kampa.[97] Venkatanatha, in his 'Hamsasandesa,' mentions that there was a big mango grove in that place. Even to-day the mango tree near the Lord's sanctuary is important. Kampa is no more a river but is merely a big tank in the temple. The poet finally lauds the city with two Gods at its east and west end.[98]

Vijayaraghava situated close to the tank Gridhrasaras[99] is the next deity that arrests the attention of the divine travellers. This tank is associated with the eagle Jatayu whose earthly remains were given to the fire by Rama.[100] The wonder of this place is the sprouting of the fried grains offered to the Lord by barren women desirous of children.[101] This is an exaggerated way of stating the motherhood bestowed on many a barren woman by the Lord. In the 'South Indian Shrines,' this place known as Tiruppukkuzhi is stated as one of the Nuttettu Tirupathi. This place is seven miles west of Conjeevaram. "Jatayu worshipped the Lord who appeared as Vijayaraghava. There is the figure of Jatayu also here." [102]

To the south[103] flows the Kshiranadi (Palar) whose purity the poet compares with that of Ganga, Sindhu, Saraswathi, Bhavahara,

93. Visvagunadarsa, p. 189, sl. 342.
94. Ibid., p. 165, sl. 293.
95. Ibid., p. 152, sl. 266.
96. Ibid., p. 175, sl. 312, 313.
97. Ibid., p. 179, sl. 320.
98. Ibid., p. 187, sl. 337.
99. Ibid., p. 191, sl. 345.
100. Ibid., p. 191, sl. 346 ; p. 192, sl. 347.
101. Ibid., p. 192, sl. 348.
102. South Indian Shrines, p. 539.
103. Visvagunadarsa, p. 193, l. 4.

Tungabhadra, Yamuna and Kaveri.[104] What this name Bhavahara denotes is a difficult question ; but it may not be wrong to identify it as Bhavani river, a tributary of the Kaveri. It is difficult to know what Krisanu means by calling the river ' Nirasa '[105] (which adjunct satisfies its modern waterless condition) when Visvavasu refers to people bathing in it.[106]

Another river flowing south of the former one is Bahanadi[107] on whose northern bank is situated an agrahara going by the name of Arisanipalagrama.[108] This village irrigated by many channels running from the river and peopled by many Brahmanas of the Atreya Gotra interested in sacrifices and headed by Raghunatha, the poet's father, happens to be situated very near the picturesque spot where Palar and Bahanadi unite.[109] This Bahanadi is known in vernacular as Cheyyar and the village is in the Cheyyar Taluq of N. A. district, since the river joins Palar only in this area. The poet also talks of many other villages of the agrahara type on the banks of the river.[110]

Now everywhere the eye looks at the vast expanse of Tundiramandala[111] (Tondaimandala) whose villages lie on the banks of Palar which happens to be one of the principal rivers of the territory.[112] Krisanu observing the overfondness of the people of the place for doing sacrifices laughs at them for indulging in unnecessary animal slaughter,[113] when his companion points out to him their necessity in doing them in view of the fact of the Vedas recommending their performance ; incidentally he also sneers at the Tengale people of the Vaishnava community hating sacrifices in spite of the explicit statements of their Acharya who denied cruelty in the slaughter of animals in sacrifices.[114] In Visvavasu's remark that abandonment of sacrifices as a cruelty is as foolish as the dis-

104. Visvagunadarsa, p. 193, sl. 351.
105. Ibid., p. 194, l. 3.
106. Ibid., p. 193, sl. 351.

continuance of marking the body with the chakra emblem on the plea of pain we get to know of this custom of emblem-marking.[115] In another verse the poet actually describes the method of imprinting the emblem with a red hot block.[116] This too much stress on Vaishnava customs makes us conclude that the poet is referring to those of the villages of North and South Arcots and Chingleput which are mostly populated by people of that community.

The aerial travellers now sight Chancheepura[117] which affords protection to many a learned scholar and philosopher. The beautiful fort on the hill with its impregnable parapet wall exacting the greatest toil and bloodshed in the camp of the enemy kings desirous of taking it is specially referred to.[118] Rulers of distant kingdoms coming all the way to capture this fort and city despite the loss of life in their own armies and the very great personal risk involved, is a matter of great curiosity to Krisanu.[119] The noble valour of these warring chiefs who though opulent and loving husbands of beautiful wives cared not for aught when the question of personal honour and dignity and a glorious loss of life on the battlefield came up is eloquently put.[120] This Gingee has been wrongly identified by the commentators as Tanjore. The very next description is that of the two rivers Pinakini and Garudanadi; after that, that of Mushnakshetra. All these are in the South Arcot District close to Gingee. We know from History the great troublous story of Gingee about this period (the middle and latter half of the 17th century). It was one of the most famous of the strongholds of the south of that time. The poet's explicit statement about the fort on the hill is overlooked by the commentators, who, to give out Chanchi as Tanjore, explain the verse as meaning an "impassable Town with rampart walls like a hill." The hill forts of Gingee are very famous and were occupied by the Nayak chiefs of Vijayanagar, by Sivaji and the family of the famous Jayasimha (Desinga Raja) in succession. It was also attacked and subjugated by the Muhammadan hordes for a time. So, then there is no doubt as to which place the poet refers.

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104. Visvagunadarsa, p. 193, sl. 351.
105. Ibid., p. 194, l. 3.
106. Ibid., p. 193, sl. 351.
107. Ibid., p. 195, sl. 355.
108. Ibid., p. 195, l. 6.
109. Ibid., p. 195, sl. 356; p. 196, sl. 357, 358.
110. Ibid., p. 196, sl. 358.
111. Ibid., p. 197, l. 2.
112. Ibid., p. 197, sl. 361.
113. Ibid., p. 198, sl. 362.
114. Ibid., p. 200, sl. 366.

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115. Visvagunadarsa, p. 202, sl. 370.
116. Ibid., p. 202, sl. 371.
117. Ibid., p. 203, sl. 373.
118. Ibid., p. 204, sl. 375.
119. Ibid., p. 205, sl. 376.
120. Ibid., p. 205, sl. 377.

The river Pinakini now referred to is known as Dakshinapinakini or Penniar; another river with very little water in it is Garudanadi which is popularly known as Gadilam.[121] This river is fed by the Mallattar, which connects it with Pennar.[122] On its bank is situated the temple of Devanayaka.[123] This deity is the Devanayaka Perumal of Tiruvendipuram of the South Arcot District.

Further on, there is the Sri Mushnakshetra[124] situated close to the Pinakini river which flows in this place through a forest region.[125] The deity of this place is Adivarahamurthi. Sri Mushnam is now a small village in the South Arcot District.

The car now proceeds and reaches the river Kaveri known also by the name Suvarnanadi and Hemapaga.[126] The situation of Sri Ranganatha in the centre of the river is also referred to.[127] Various trees and plants like Vakula, Amalaka, Kadamba, Mandara, Sahakara (Mango), Jambu, Kapittha (wood apple), Kramuka (Arecanut), etc., growing on the banks of the river[128] appear on account of the blossoms at their top, like passengers ready to cross the river with their clothes on their head.[129] This is a very true and charming picture of how the South Indians cross a river and it speaks volumes of the close observation of detail in life. Mango trees are specially stated as plenty near the river[130] and this is no exaggeration when even to-day the region of Kavery abounds in that species of trees. The rise of the river in the Western Ghats is stated when in imitation of Venkatanatha our poet describes the course of the river from the Sahayadri (Western Ghats) to the sea comparing her to a bride bound for her husband's home.

Sriranganagara is now the object of the eye and the scholarly lives of its inhabitants is very much exaggerated[131] by the poet by

121. Visvagunadarsa, p. 207, sl. 381.
122. Indian Companion.
123. Ibid., p. 207, sl. 381.
124. Ibid., p. 208, sl. 382.
125. Ibid., p. 209, sl. 384.
126. Ibid., p. 216 sl. 391, 392.
127. Ibid., p. 217, sl. 394.
128. Ibid., p. 213, l. 1-5, p. 214, l. 1-9, p. 215, l. 1-8, p. 216, l. 1-3.
129. Ibid., p. 217, sl. 395.
130. Ibid., p. 217, sl. 393.
131. Ibid., p. 218, sl. 396, 397.

saying that parrots, peacocks, and cuckoos enter into polemical and other kindred discussions. The seven prakaras of the temple of Ranganatha with the Pushkarini tank are mentioned.[132] The name Chandrapushkarini of the tank is also specially stated.[133] In the Indian Architecture it is stated that there are several Gopurams or towers to this temple, each of them having a design of its own and differing from its neighbour in the outline, details, and size; but the whole mass is so harmoniously blended as to impress any visitor or engineer with the sublimity of its design and the mastery of its construction. The whole temple consists of seven prakaras or enclosure walls, with streets and dwelling houses round and round the inner shrine. Lakshmi, the consort of the Lord, and Garuda are noted.[134] The Garuda Mantapa in the Srirangam Temple is worthy of notice. Krisanu hates the practice of this place, that of offering the Lord's prasada for sale and condemns in strong terms the priests of the temple who are the perpetrators of that sin.[135]

Not far from Srirangam and on the banks of the river Kaveri, there is the Saiva shrine of Jambukeswara with four prakaras.[136] The poet by an equivocal use of the word 'Sapta prakaras' tries to compare the temple with that of Ranganatha. The poet himself explains this ambiguous word as meaning 'Jatadhara,' which is further explained by the commentators to mean four. But then there are five prakaras for the Jambukeswara temple. The particular phenomenon of this place, that of the lingam bathed perpetually by water is referred to by the poet as the Kaveri drenching the Lord perpetually.[137]

These two last-referred places being situated in Choladesa, some account of the territory is now given. This territory which is everywhere filled with Siva and Vishnu temples is famous for its mango groves and arecanut trees entwined by high class betel leaf creepers.[138] The banks of the Kaveri abound in tall cocoanut

132. Ibid., p. 221, sl. 402, p. 239, sl.. 441.
133. Ibid., p. 223, sl. 406.
134. Visvagunadarsa, p. 227, sl. 416, p. 234, sl. 431.
135. Ibid., p. 237, sl. 438, p. 238, sl. 439.
136. Ibid., p. 239, sl. 442.
137. Visvagunadarsa, p. 240, sl. 445.
138. Ibid., p. 241, sl. 446, 447.

palms laden with fruit as if to offer them to the Lord in the orbit of the Sun.[139] Punnaga trees are abundant in this place.[140]

The people of the place are described as intent on doing sacrifices, reading Vedas, sastras, and puranas;[141] but Krisanu feels vexed with them for eating puratana (cooked rice preserved in water for the night) in spite of their bath in the river, performance of the Sandhya, etc., study of sastras, worship of gods and hospitality to guests.[142] The peculiar feature about the women of the place is that they wear no petticoat.[143] The poet describes one other custom of this place, that of women collecting in large numbers to sing love songs outside the house of any girl attaining puberty.[144] In two more dubious verses which are ascribed to the poet's pen there is given a picture of the typical Chola daughter-in-law with her hair, eyes, mouth and breasts, bereft of oil, collyrium, betels and sandal paste respectively and devoid of good dress and flowers; her shoulders marked with the stain caused by the bearing of water-pots (here the poet refers to their peculiar custom of carrying water-pots on their shoulders) her feet covered with dung stuck to them in the act of trampling it (here there is a reference to the trampling of cow dung before making it into cakes), her hands all rough because of cutting grass (here the custom of cutting or gathering grass for cattle), her eyes all red with the smoke of the kitchen (here a reference to the exclusive duty of cooking given to the daughter-in-law), she is the very incarnation of misery.[145] Though a bit exaggerated, there is a good deal of truth in the custom to which reference is made by the poet and it is a good picture of the South that we get from his pen.

Near by, there is Kumbhaghonam on the banks of the Kaveri and reference is made by the poet to the Vaishnavite temple of the Deity Sarangapani.[146] Not far off in Champakaranya is situated Sri Rajagopalamurthi,[147] who is the same as the deity at Mannar-

139. Visvagunadarsa, p. 242, sl. 448.
140. Ibid., p. 242, sl. 450.
141. Ibid., p. 244. s. 452.
142. Ibid., p. 244, sl. 453.
143. Ibid., p. 245, sl. 454.
144. Ibid., p. 245, sl. 456.
145. Ibid., p. 246, The two slokas quoted in the commentary.
146. Ibid., p. 248, sl. 460.
147. Ibid., p. 248, sl. 461.

gudi which is also known as Raja Mannargudi. The Lord is also known as Sanatna Gopala. This temple is perhaps the last that these divine travellers visit in the south. That there are numerous other temples and sacred places of importance is not forgotten by the poet and he makes Visvavasu refer to all of them in an eulogistic tone.[148] Krisanu now comes forward with a woeful tale of the mismanagement of temples by characterless men worshipping the Lord with hands defiled by the touch of prostitutes, muttering mantras with a mouth full of betels chewed by the harlots, and robbing the deity of his wealth with an unflinching hand.[149] The cooks in the temple are also as bad in character, their additional qualification being illiteracy in the sacred lore.

After travelling some more distance the Gandharva pair near the Setu with the foamy waves dashing and springing over the hills sunk in the sea.[150] These mountains in the sea might be the small islands between Dhanushkodi and Ceylon. The power of the sea to absolve the pilgrims of their sins by a bath in its waters is also stated.[151]

Further south flows the river Tamraparni[152] and on its banks is Kurukapuri inhabited by Vaishnavas well versed in Tamil Prabandhas.[153] Kurukapuri is Alwar Tirunagari in the Tinnevelly district and this is the famous birthplace of Sathakopa muni, the author of the Dravida Veda.[154] The tamarind tree in whose shade the sage wrote the work is in this very place. The people of the place are mostly Tengales and Krisanu again repeats his charges against these people.[155] He is particularly hard against the Vaishnava sanyasins who neglect bath about the Sandya time, the bearing of kamandalu, the observance of Chaturmasya and bhikshatana, contentment and study of Vedas ; [156] and more so when he sees them enter capital cities and towns to earn money and eat sumptuously in the name of God.[157] Again, he is not so horrified at the

148. Visvagunadarsa, p. 250, sl. 465.
149. Ibid., p. 251, sl. 466.
150. Ibid., p. 256, sl. 476.
151. Ibid., p. 259, sl. 486.
152. Ibid., p. 260, sl. 487.
153. Ibid., p. 260, sl. 488.
154. Ibid., p. 261, sl. 489.
155. Ibid., p. 261, sl. 491.
156. Ibid., p. 264, sl. 500.
157. Ibid., p. 265, sl. 501.

ascetic bowing to householders as when he sees them bowing to the Sathanis.[158]

This place happens to be the last to be visited by the two divine travellers and we have in their conversations sufficient information about India in the 17th century since the poet merely gives out his account through that dyad, his own creation. Historical information is very great in this book and is of a very valuable nature giving us an insight into the manners and customs of the various people in various parts of this almost a continent-like country; the peculiar customs of minor sects and creeds are not overlooked. The rise of the Mahrattas and their wars with the Mussalmans are important and noteworthy. That the Brahmins of Maharashtra held the posts of karnams or village accountants is clear from Vincent Smith's History of India where it is stated that "the details (of accounts) were purposely made as intricate as possible, so that nobody except the professional Mahratta Brahmin accountants could understand them. All clerical and account work was in Brahmin hands." [159] The state of the Andhra territory as described in the book is not far from truth. Again, the statement about the Gingee fort and territory is of historical value. The peculiar characteristics of the Lingayats of Mysore, the Tengales of Sriperumbudur, Alwar Tirunagari and other places, the Madhwas of Udipi, the English merchants of the East India Company at Madras and the Mussalman warriors holding sway over many a kingdom are interesting and instructive. Whatever might be the bad odour in the sneers and gibes of Krisanu they supply us with a fund of information about the people of the time, their likes, dislikes, tastes and idiosyncracies. But a study of the book would strongly suggest to the reader the advisability to take a view of things akin to Visvavasu's.

Chairman's Concluding Remarks: The Chairman complimented the lecturer on the combined insight and sympathy and the constructive criticism displayed by the address. Geography has been our weak point. North Indian authors do not describe South India well; nor do South Indian authors describe North India well. Our ancient geography will be largely coloured by theology. But we know that the earth is round and moving round the sun and

158. Visvagunadarsa, p. 265, sl. 502.
159. V. A. Smith's Oxford History of India, p. 434.

had a fairly accurate knowledge of India and the surrounding countries. Our passion for Theertha and Kshetra (holy rivers and temples) led to individual purity and communal amity. The author of *Viswagunadarsa* adopted the device of the aerial car from the Ramayana just as Kalidasa took the *sandesa* (message) idea from the Ramayana. But his work shows a Vaidika Vaishnava Brahmin abroad and does not give us a full and complete idea of the court life and the commoner's life or the secular institutions. Even among temples, Saiva temples are largely omitted. When describing Kumbakonam, Sri Sarangapani's temple is described but Sri Kumbheswara's shrine is omitted. Of course Srirangam bulks large but Chidambaram vanishes. Even among the Vaishnavas, the Tengalais come in for caustic comment. The commentator's limitations are seen in his taking Chanjipuri to be Tanjore instead of saying that it is Gingee. The poem introduces two Gandharvas—Krisanu and Visvavasu—as describing the various places seen by them from Badari to Setu. Krisanu is the destructive critic and Visvavasu is the constructive critic. When describing Madras, the former laments the loss of purity and tenderness in life but the latter praises the elements of order and progress and justice and inventive skill which we owe to the Hunas (the English). It thus appears that the real welfare of India consists in combining these elements with purity and unity.

With a vote of thanks to the Chairman and the Lecturer, the meeting came to a close.

COIMBATORE

The Distribution of Crops in the Vizagapatam District*

BY

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The variation in the cropping of the different tracts of this district affords an interesting study to students of agriculture as well as to those of Geography.

Only six principal crops will be dealt with here, in some detail, paddy (Oryza sativa), ganti (Pennesetum typhoideum) and chodi (Eleucine coracana) being the chief food crops and gingelly (Sesamum indicum) groundnut (Arachis hypogea) and sugarcane (Sacharum officinarum), the chief money crops.

In considering the distribution of these crops the district may be divided into three broad divisions, the Agency, the northern taluks of the plains and the southern taluks of the same. Statement I appended shows the area under the different crops as well as the rainfall in the three seasons, the hot weather, South-west Monsoon, and North-east Monsoon.

Paddy is the most largely grown and the most ubiquitous of the crops. It is extensively grown in almost all the taluks under conditions good, bad and indifferent, on account of its high status among the food grains and its being capable of easy cultivation wherever there is sufficient rainfall or water for irrigation. Till the slump in its price came on recently, this was, in addition to being a food crop, also a money crop, the surplus produce finding a ready market at a fair price so that the ryots were anxious to possess as much wet land as possible. The two Agency taluks of Naurangapur and Jeypore show the largest area under this crop, which runs up to nearly 5 lakhs of acres out of a total of about 11 lakhs in the whole district. The large extent of fertile land avail-

* Summary of a lecture delivered under the auspices of the Vizagapatam Branch of the Madras Geographical Association.

able there and the assured rainfall of over 50 inches admit of its cultivation, mostly without irrigation, on such a large scale and with very little trouble or cost. In the Taluks of the plains facilities for irrigation chiefly determine the area. Palakonda Taluk, which has the advantage of the Nagavali system, possesses the largest area of nearly a lakh of acres under this crop, while the others possess areas ranging from about twelve to sixty thousand acres, the extent depending upon the area of the taluk and its irrigation facilities, and present no interesting features.

Chodi and *Ganti* are two other important food crops and their distribution is somewhat interesting. Ganti being a native of dry tropical Africa is little grown in the agency tracts which are too cold and receive a heavy rainfall. Chodi on the other hand tolerates cold as well as heat and moisture and is therefore grown largely both in the plains and agency tracts. The greater portion of the area under Chodi lies in the agency and is shared by the Pottangi and Padwa Taluks which grow nearly half the total area of 5 lakhs under this crop in the district. In the plains, while in the northern taluks Chodi predominates, Ganti does so in the southern taluks as shown in the statement below :

	Area in Acres.	
	Northern Taluks.	Southern Taluks.
Chodi	153607	50453
Ganti	74839	123316
Ratio of Ganti & Chodi	67 : 33	29 : 71

The ratio of Ganti to Chodi are 67 : 33 and 29 : 71 for the northern and southern taluks respectively. Why should these ratios be thus the reverse of one another in the two areas ? The answer is somewhat difficult to find. The average rainfall in the northern taluks in the "Tholakari" season is no doubt somewhat heavier than in the southern taluks, but this difference does not appear to be large enough to warrant such a thorough reversal of the ratio, for a large difference in this respect between the eastern and the western taluks of each area does not result in a similar variation in the areas of the two crops.

When, however, this difference in rainfall is considered with the nature of the soil, which is generally shallow and not quite so well drained in the northern taluks as in the southern ones, the phenomenon appears somewhat explicable.

Gingelly and *Groundnut*, the two oil-seed crops of the district, also present a similar phenomenon. The areas under these two crops are noted below:

	Area in Acres.	
	Northern Taluks.	Southern Taluks.
Groundnut	95041	20871
Gingelly	45313	73744
Ratio	68 : 32	23 : 77

Like Ganti, Gingelly does not tolerate excessive moisture and therefore appears to be preferred in the southern taluks to Groundnut which not only tolerates greater moisture but requires the soil to be evenly moist during the period of its growth which is longer than that of gingelly. The former is uncertain especially in regions of heavier rainfall and ill-drained shallow soils as in northern taluks, while the latter suffers in regions where the soil dries off more quickly during spells of drought, as in the better drained soils of the southern taluks.

The area under *sugar-cane* in different taluks is influenced by the facilities for irrigation which the crop requires during the greater part of the year and the nature of the soil. If the latter is not favourable the crop does not adequately repay the trouble and heavy expense of irrigation, manuring and other operations which its cultivation specially involves. The alluvial soils on the sides of the Varaha in the Golgonda Taluk, the Sarada in the Viravalli, Anakapalli and Sarvasiddhi taluks and the Nagavalli and other streams in the Parvatipur, Bobbili and Palakonda taluks afford such favourable conditions, which account for the larger areas under the crop in those taluks. In the Palakonda, Parvatipur and Bobbili taluks, timely and heavier rainfall is also partly responsible for the larger areas under this crop. In the southern taluks the better drainage and underground water-supply in the sugar-cane growing areas favour not only the cultivation of this crop on a larger percentage of the area under paddy (6.9% against 3.8% in the northern taluks), but are also responsible for the higher standard of cultivation and the resultant comparatively higher yields. Besides the above soil and climatic conditions, the area under sugar-cane cultivation is influenced to some extent by the industry of the agricultural communities inhabiting the tract. Wherever the Gavaras are the predominating agricultural community as in the southern taluks, sugar-cane is largely grown and its standard

of cultivation is also high. The recent introduction of new varieties of sugar-cane such as J. 247 and Co. 213 (the latter of which can be planted with a single irrigation or with the help of a heavy rain and thereafter grown successfully without any further irrigation or elaborate propping or wrapping) has also influenced and is likely to influence the areas under this crop especially where it is now grown on very small areas as in the Vizagapatam, Vizianagaram and Srungavarapukota Taluks.

Having dealt with the six main crops it may not be out of place to make a passing reference to a few other crops whose distribution also calls for some comment.

Jonna (Andropogon Sorghum) as a regular crop is confined to the black soil areas of a few taluks, Golugonda, Vizianagaram, Salur and Bobbili, occupying about 75 thousand acres on the whole. It is also grown on some hill-slopes under what is known as "Podu" system. The black soil crop is of a shorter duration and is sown in September-October, while the Podu varieties are of a longer duration and are sown in June. Both flower at the end of the rainy season, this being an essential factor for a good yield. Jonna is also sometimes grown in the lighter soils, but chiefly in paddy lands, when it is not found possible to grow paddy for want of rain or water. In such years the areas under Jonna swell up.

The cultivation of *Gogu* (Hibiscus cannabinus) is practically confined to the northern taluks (excluding Salur) which answer for 25,000 acres out of a total acreage of about 26,000 acres in fasli 1342. Why this crop should be so almost entirely confined to the northern taluks is not clear. The proximity of the Jute Mill at Chittivalasa at the entrance to the port of Bimilipatam, from which the fibre and gunnies made of it were largely being exported, might have been a chief factor in the development of the cultivation of this crop in the northern taluks. Soil and climatic conditions do not appear to be responsible for the almost entire elimination of the crop from the southern taluks.

Chillie is the chief condiment grown in the district, and occupied about 35,000 acres in fasli 1342. Of this area the Vizianagaram Taluk alone accounts for about 20,000 acres; the light red soils of this taluk with numerous wells probably facilitate the cultivation of this crop there. Like Jonna it also sometimes takes the place of paddy in years of drought.

Tobacco is fairly well-distributed over the whole district occupying about 50,000 acres in fasli 1342. The largest area is

found in the Rayagada taluk which had about 13,000 acres in the same fasli. I have not visited this taluk. Perhaps the rich virgin soil said to be available there accounts for its large production.

The explanations attempted to be given for the variation in the areas of the above crops in the different taluks, are based on observations made in the course of my tours. Students of Geography may in their holidays take up the study of this subject on a more satisfactory basis and throw more light on the causes of the variations.

Before concluding I should like to briefly discuss the effect of the variations in the distribution of the crops on the economic condition of the ryot. I am not much acquainted with the agency tracts and shall leave this area out of consideration. In the plains the economic condition of the ryot depends upon two factors. One is his capacity to produce the food and fodder he and his cattle require. The other is his capacity to produce such articles as would by their sale procure him the cash required for his cultivation expenses, assessment or rent on the land and his domestic cash expenditure. In this district, on the whole, the ryot's system of cropping enables him to obtain both the food and cash requirements unless the holding is too small or the season very unfavourable. The food crops grown being a common factor in the northern as well as southern taluks, it is the money crops that chiefly contribute to any differences in the economic condition of the ryots in the two tracts. Of the money crops sugar-cane appears to be the most advantageous, as it affords scope for the utilisation of the family labour throughout the year without demanding extra labour on any large scale and brings on a larger net income per acre than any other crop. The crop thus enables even ryots with small holdings to command the cash they require. Gingelly, though an uncertain crop, is very easily grown; and even if it fails, the value of the seed is small. It is not the sole crop in the year, preceding a cereal in dry lands and preceding or following paddy in wet lands. For both Gingelly and Jaggery there is a large local demand whatever the price may be. Groundnut, which is mostly an export crop is a source of considerable profit when it commands a good price and so long as there is demand. Its introduction about thirty years ago and its extension to over a lakh and a quarter acres since then were largely responsible for the prosperity of the ryots of the northern taluks who took to it. When the prices go down and the demand is not brisk, however, as in the past few years, this crop does not fit in so well into the eco-

nomics of the ryot as gingelly on account of its higher cost of cultivation and seed rate and its being the main crop for the year. Gogu is even worse in this respect and its cultivators in the northern taluks have been, of late, suffering from the slump in its price and want of demand, the produce not fetching even the cost of extraction in some cases. On the whole the fortunes of the ryots of the southern taluks who depend on sugar-cane and gingelly have been more steady than those of the northern taluks who depend upon groundnut and gogu as their money crops; and the better soil and the more intensive cultivation practised in the case of sugar-cane made the ryot of the southern taluks economically better off in general than his brother in the northern taluks.

Statement showing the areas of six principal crops and the distribution of rainfall in the plains separately for the six northern and the six southern taluks.

No.	Taluk	Paddy	Chodi	Ganti	Gingelly	Groundnut	Sugarcane	Rainfall (average of 40 years) Feb. to May.	June. to Sept.	Oct. to Jan.	Total.	Rainfall April. May. & June.
1.	Golugonda ..	35123	11419	32933	23701	37	1477	6.76	24.86	10.93	42.55	10.26
2.	Sarvasiddhi ..	52757	14777	34337	20687	61	753	4.10	21.38	11.67	37.15	7.25
3.	Viravilli ..	43000	15625	21471	12881	1437	9688	5.79	25.48	12.12	43.39	10.34
4.	Anakapalli ..	29898	16110	33791	7396	1312	2303	3.72	21.10	11.11	36.53	7.21
5.	Vizagapatam ..	12000	7653	23000	2194	6620	110	4.04	19.97	14.79	38.80	6.91
6.	Srungavarapukota ..	37374	9255	8075	6885	11404	233	6.31	27.75	8.56	42.62	9.99
		210162	74839	153607	73744	20871	14584	5.12	23.52	11.31	40.51	8.66
1.	Vizianagaram ..	64702	45190	27919	6122	26977	543	5.02	25.02	11.86	41.92	8.40
2.	Chipurupalli ..	25200	21840	15863	6335	26280	128	3.83	25.34	10.80	39.97	7.80
3.	Palakonda ..	95900	18928	861	6242	19896	2368	5.88	32.60	7.72	46.20	10.11
4.	Bobbili ..	53460	18813	1270	16183	15362	2865	5.64	28.06	7.11	40.81	9.62
5.	Salur ..	13991	12250	3770	2463	3332	670	5.68	27.28	10.39	43.35	9.92
6.	Parvatipur ..	34746	6295	770	7968	3194	4438	6.67	30.90	8.37	45.94	10.79
		287999	123316	50453	45313	95012	11012	5.45	28.20	9.38	43.03	9.44

Statement showing the areas of the six principal crops and the distribution of Rainfall in the Agency tracts.

No.	Taluk	Paddy	Chodi	Ganti	Gingelly	Groundnut	Sugarcane	Rainfall, average for 40 years. Feb. to March.	Jan. to Sept.	Oct. to Jan.	Total.
1.	Pottangi ..	55,000	1,10,050	—	—	—	400	7.94	44.43	8.68	61.05
2.	Padwa ..	8,000	1,30,000	—	—	10	200	8.99	40.54	5.85	55.38
3.	Naurangapur ..	2,27,000	2,000	—	200	—	2,400	4.44	55.36	3.91	63.71
4.	Jeypore ..	1,60,200	19,300	—	990	180	3,110	4.99	65.06	4.92	74.97
5.	Others ..	68,214	48,147	5,516	14,839	1,835	2,130				
	Average for the Agency Taluks.							6.25	43.90	6.08	56.23

The Earth: Its Evolution and Structure*

By

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THE ORIGIN OF THE EARTH

According to the astronomers, about 3600 million years ago, a passing star by its tidal action tore off small fragments from the sun, which formed the planets of which the earth is one. We mark this as the time of planetary and lunar growth.

THE AGE OF THE EARTH

The element uranium is spontaneously disintegrating int helium and lead. This process has remained uniform throughou geological time, independent of temperature, pressure and othe external conditions, as it is the nucleus that is involved in the decay. As we know the rate of this disintegration process, a measurement of the quantity of uranium and lead in a rock will give it age. From this uranium decay, physicists estimate the age of the earth to be nearly 3600 million years.

EVOLUTION

A careful study of the markings and the fossils in the rocks has revealed to us the past history of the earth's life. The molten earth gradually cooled in course of time with the formation of a crust, the atmosphere and water. The primordial ocean slowly acquired the various mineral salts from the rocks, thus building up the inorganic environment for life. The ten essential elements, Hydrogen, Oxygen, Nitrogen, Carbon, Phosphorus, Sulphur, Potassium, Calcium, Magnesium and Iron are present in all living organisms forming inorganic compounds in colloidal suspension. The inorganic cell, through energy received from the sun, developed

* Summary of a paper read before the Coimbatore branch of the Madras Geographical Association.

certain chemical agents known as enzymes which brought about chemical co-ordination. Thus the cell became alive and capable of developing its organic plasma from the inorganic elements of its environment. And by a slow process of evolution through millions of years, life has developed from the unicellular to the multicellular, from the lower to the higher organisms. But this evolutionary process had never been uniform due to the great changes in the earth's climate, as a result of the changing shape of the earth's orbit, the gradual shifting of the poles of rotation and fluctuations in the heat of the sun itself.

THE GEOLOGICAL ERAS

The life history of the earth begins with the Azoic era which covered a vast period of 2100 million years. The earth's molten exterior solidified and an atmosphere rich in carbon-dioxide was formed. Evolution was confined entirely to the mineral kingdom. During the next epoch, the Archæozoic, unicellular organisms namely the amœba and the protococcus made their appearance. The cell wall of the amœba is nitrogenous, whereas that of the protococcus is of cellulose, thus indicating that the amœba is the starting point of the animal kingdom and the protococcus that of the plant kingdom. The Archæozoic era covered nearly a period of 575 million years. During the next era, the Proterozoic which lasted for 375 million years, the unicellular organisms instead of separating after division, clung together. Thus the protozoa became the metazoa or the many-celled organisms.

The Palæozoic era began about 550 million years ago and covered a period of 360 million years. It is divided into seven periods. The first of these is the Cambrian. During this time most of the land areas were north of the equator. There were two large continents and three smaller ones. The one that corresponded to North America was Laurentia. It was largely polar. The great southern continent of Gondwana occupied a large part of South America and extended across the Atlantic including Africa and a part of Europe and Asia. Cascadia extended from what is now Eastern Asia to Alaska and south along the western part of the United States. Lemuria included Japan, East Indies and Australia. Archinotis was an Antarctic continent. During the second period, the Ordovican, the climate was warm throughout the world and evolution proceeded rapidly. The Silurian period was ushered in by a frequent rise and fall of continents due to the movements of the

earth's crust. During the Devonian period, the outlines of the continents were greatly changed. Laurentia had shrunk and connected Greenland with Northern Europe. The larger part of North America was included in Cascadia, which extended across the Northern Pacific, covering a major portion of Asia and curving southward to include Australasia. The whole formed the great continent of Lemuria. The third and last continent Gondwana included Archinotis in the far south, the present continent of South America, a broad land bridge across the Atlantic, Africa and India. During this time land plants became abundant and fish, probably the first vertebrates, swarmed the seas. Naturalists are of opinion that the backbone has developed from a structure known as the notochord running along the back of creatures like the acorn-worm and the sea-squirt, which are probably the only surviving representatives of the many ancestral forms from which fish may have arisen. The last three periods of the Palæozoic era, the Missisipian, the Pensylvanian and the Permian are grouped together under the general name of 'the Carboniferous age', due to the formation of coal during this time. The end of the Palæozoic era was marked by great upheavals of nature. The climate began to grow cold and snow fell where tropical conditions had prevailed for millions of years.

The Mesozoic era of the Age of Reptiles began 190 million years ago and is divided into four periods. In the first period, the Triassic, the climate was dry throughout the world. Vegetation was stunted due to the adverse conditions under which it suffered. During the Jurassic period there was a rapid development of seed-bearing trees. In the animal kingdom, new creatures called the reptiles made their appearance for the first time. Some of these reptiles called dinosaurs had attained very huge sizes. From the reconstructed fossil remains we find that some of these beasts were more than 100 feet from snout to tail. These gigantic creatures would have presented a very strange and bizarre appearance to our eyes. At the end of the Jurassic age the extreme cold completely wiped out these giant reptiles and they thus became extinct.

A group of small hopping reptiles, driven by competition, went up the higher hills. To protect themselves from the cold they developed feathers. These were the first birds. The fossil remains of the bird Archæopteryx show that it had reptilian teeth in its jaws and a long reptilian tail. The earliest mammals like the ear-

liest birds were creatures driven by competition into a life of hardship and adaptation to cold. Instead of feathers, they developed a thick hairy skin. The primitive bird Kiwi of New Zealand is perhaps a connecting link between the reptile and the bird, so also the duck-billed Platypus of Australia, perhaps a connecting link between the reptile and the mammal.

The last period of the Mesozoic era, the Cretaceous, was marked by the subsidence of North America. Australia and South America were largely under water. This was a very quiet period. But the end of the era was marked by the greatest series of volcanic eruptions in the earth's history and these took place largely in Asia.

We pass on to the last era, the Cenozoic or the era of mammals which began 55 million years back, a very short time when compared with the vast ages which we have passed under review. It is divided into five periods, the Eocene, the Oligocene, the Miocene, the Pliocene and the Pleistocene. The Eocene period was one of mammalian advance, especially of the earlier forms of the horse, the elephant and the rhinoceros. The Miocene age was one of very violent volcanic outbursts and considerable changes in the earth's crust. The climate was warm even in the Arctic regions. There was a luxuriant growth of grasses necessary for mammalian evolution. In the animal kingdom, the lemurs and the apes had made their appearance. It was during the later half of this period that the Himalayan range was thrown up. The Pliocene and the Pleistocene were periods of great continental elevation. During the end of the Pleistocene period there was a steady lowering of temperature all over the world which resulted in glaciation. The outlines of the present continental areas were probably firmly established during the later half of the Cenozoic era.

APE-MEN AND TRUE-MEN

Naturalists divide the class of mammalia into a number of orders and at the head of these is the order of Primates which includes the lemurs, the monkeys, the apes and men. It is very difficult to decipher the past history of the Primates in the geological record, as their remains are rarely covered up by sediment. The crude flint implements of the Pleistocene age found in some parts of the world are the most ancient authentic evidence of man. These flint implements are called Eoliths or dawn stones. In a million

year old deposit at Trinil in Java, discovered by Dubois in 1891, was found a piece of skull and bones of a sort of apeman with a brain case bigger than that of any living apes. He seems to have walked erect and hence he is called Pithecanthropus Erectus or the Java Apeman. In a sand pit at Heidelberg which is supposed to be a quarter million years old, was found a quasi-human jaw bone of probably a human monster, who might have fought with the mammoth and the sabre-toothed tiger. The past history of this creature is quite enigmatical. The remains of a thick sub-human skull and bone implements estimated to be hundred years old were found at Piltdown in Sussex. This creature is called the Eoanthropus or the dawn man. The discovery of the remains of the Sinanthropus or the Peking man in Central Asia is a recent one. But none of these above-mentioned seems to be the direct ancestor of man.

The discovery of some quasi-human bones at Neanderthal prove the existence 50 thousand years back of a sort of apeman, the Neanderthaler. In a cave at Cro-Magnon a number of skeletons have been found which prove to be the earliest true-human remains. We call these the Homo-Sapiens or the first true men. A discovery in 1921 in South Africa proved to be the relic of a third sort of man, called the Rhodesian man, intermediate in its characteristics between the Neanderthaler and the Homo-Sapiens. The bones, weapons and rock carvings dating back to 30,000 years found in France and Spain belong to the first true men. There have been no finds of the higher primates in America and we presume that this development of life was almost exclusively an Old-World phenomenon.

Tracing the pedigree of man, naturalists have come to the conclusion that he has evolved from an ape-like ancestor. The human embryo seven weeks old has a tail and the remains of a muscle, the Agitator Caudae that once moved it about. Nothing else shows more clearly that man has come from a tailed ancestor. Infants bend their feet inwards, so that the soles in a great measure face one another. We find the same among the simians in whom the feet are turned inwards to help them to grasp the branches. The Darwin's point in the human beings, which is more in evidence at birth than in later life, is a relic of the turned over pointed tip of the ear of the common ancestor of the man and the ape. Prof. Elliot Smith says: "No structure found in the brain of an ape is lacking in the human brain; and on the other hand the human brain

reveals no formation of any sort that is not present in the brain of the gorilla or the chimpanzee. The only distinctive feature of the human brain is a quantitative one. Not only man's brain, but his bones, muscles, nerves and blood vessels—in fact all his organs—are almost exact replicas of the corresponding parts in the apes."

EMBRYOLOGY

Almost all the animals including man in their embryonic stages bear a striking resemblance to one another. And in the development of the embryo during the prenatal life we actually witness the wonderful process of evolution. In the words of the biologist, 'Ontogeny' or the development of the individual is a recapitulation of 'phylogeny' or the history of the species. Dr. Saleeby says, 'Had we seen for ourselves the aeonian evolution of man from the primitive slime, but never witnessed the relatively instantaneous development of a man from a human germ, we might well account the latter impossible. But having seen the greater marvel we cannot call the lesser incredible.'

Eras	Organisms	Time in million years	Our scale		
			m	d	h
Azoic	Lifeless	2100	7	—	—
Archæozoic	Unicellular	575	1	28	—
Proterozoic	Invertebrates	375	1	7	—
Palæozoic	Amphibians Fish	360	1	6	—
Mesozoic	Reptiles, Birds	135	—	13	12
Cenozoic	Mammals	55	—	5	12
	Man	1	—	—	2.4

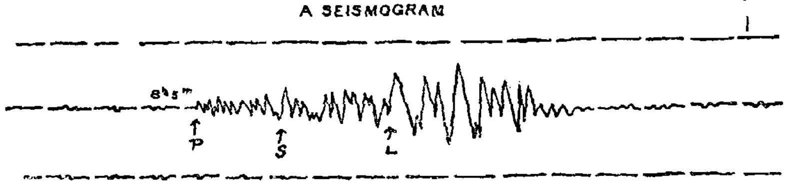
INTERNAL STRUCTURE OF THE EARTH

So far we have made a brief survey of the external features of the earth. We shall now probe deeper into the earth and have a view of its internal structure as revealed by modern seismology. For us, an earthquake is a rare phenomenon of passing interest; for the Japanese, it is a dreaded horror. An earthquake is a re-

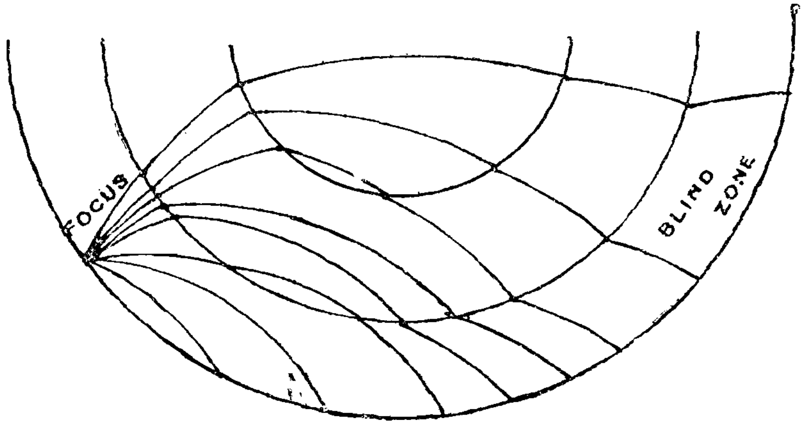
lease of energy from inside the earth, generally caused by either volcanic activity or sudden changes in the earth's crust. The earthquake shocks, after traversing the earth for various distances and along various paths, are finally recorded on the seismographs set up at various stations on the earth. The nature of the records indicates the paths by which the signals reached the instrument and the properties of the materials through which they passed.

Earthquakes are supposed to originate at depths of 25 miles or less. In every earthquake there are three distinct types of waves, which arrive in the same order always. These are (1) the longitudinal or P waves—waves of compression and rarefaction, (2) the transverse or S waves—waves of distortion, and (3) the surface or L waves which are both longitudinal and transverse. These waves are shown in the seismogram reproduced.

A SEISMOGRAM



The earth has a spherically layered structure, consisting of a central core surrounded by a series of shells of different thickness, each with its own distinct properties. The spherical surfaces separating the various shells are known as surfaces of discontinuity, as the transition from one layer to another is relatively sudden. The surface of discontinuity surrounding the central core is about 1800 miles below the surface of the earth. The central core is supposed to be made up of iron and some nickel. Here we have a large part of the extra density to make up for the light surface rocks and average up the earth's density to 5.6 as determined by the physicists. It is supposed that the central core though dense under high pressure is not an elastic solid. The S waves which will not be transmitted through a liquid or gas do not traverse the central core. The P waves are refracted at the surface of discontinuity in such a way, that they fail to reach stations which are between 7,000 miles and 1,000 miles of the epicentre, leaving a blind zone as shown in the figure. The velocity of the P wave is about 8 miles per second just outside the central core, but within the core it drops suddenly to 5.3 miles per second, as deduced mathematically from the earthquake records,



Surrounding the central core, there are three layers of slightly different properties. The discontinuity at the outer border of the triple layer is at a depth of 750 miles. The material composing these three layers is silicon with a little iron. The three layers together constitute what is known as the transition layer. The upper boundary of the next layer, made up of silica and magnesium, is at a depth of nearly 40 miles. According to Prof. Jeffreys, the outer crust is composed of three layers, separated by discontinuities at depths of 7½ and 23 miles. These he terms in order descending, the granitic layer, the basaltic layer, and the ultra-basic layer, thus indicating the probable nature of their constituent rocks. It is supposed that the inner 20 miles thickness consists of igneous rock forming materials existing at temperatures which vary outwardly from about 2000°C to something approaching atmospheric temperatures and having a structure varying from that of a semi-molten mass to that of the crystalline igneous rocks exposed on the earth's surface. The outer 20 miles thickness consists mainly of irregularly distributed stratified and igneous rock formations. The igneous rocks which make up so large a portion of the earth's crust come under two groups: (a) the granitic group, which consists of the lighter and more infusible rocks and (b) the basaltic group which consists of the heavier and more fusible rocks. The stratified rocks, though they have been derived from the igneous rocks and have nearly the same chemical composition, yet they differ from them very much in physical structure and individual chemical composition. They are divided into two classes: (1) the siliceous and (2) the calcareous. The siliceous rocks are composed of sands, mud and other mineral matter which have become stratified due to gravitational pressure, hydration and other

such influences. The calcareous rocks have been produced from the shells and other remains of marine organisms, which under the same influences as above, have been transformed into the limestone formations. While the average chemical composition of the stratified rocks closely approaches that of the earth's crust, their individual composition varies from the nearly pure silica of some of the quartzites and sandstones to the nearly pure carbonates of magnesium and calcium of some of the dolomites, and the nearly pure calcium carbonate of some of the limestones.

An analysis of the earth's crust gives the following percentage average chemical composition:

Silica 59.87	Magnesium Oxide 4.06.	
Alumina 15.02	Calcium Oxide 4.79	
Ferric Oxide 2.58	Sodium Oxide 3.39	Titanium Oxide 0.72
Ferrous Oxide 3.40	Potassium Oxide 2.93	Other Oxides 3.24

THE SEISMOGRAPH

The instrument called the seismograph records the movements of the earth. Fundamentally the seismograph is a pendulum, but the motion is reversed. The heavy mass of the pendulum remains stationary while the earth swings. And so, any motión of the earth's surface is recorded. If the instrument is properly damped to prevent the pendulum from swinging in its natural period after it receives an impulse, then the true earth movement can be determined from the resulting seismogram.

The best types of seismograph are photographic. The horizontal instrument records the motion of the earth parallel to the surface. Divested of all its appliances for reducing friction, providing amplification and modifying the amplitudes, the apparatus is a simple horizontal pendulum; to this is attached a small concave mirror. Several feet away are a recording drum and a lamp. The drum is covered by a photographic sheet. Light is projected from a slit in the lamp to the mirror of the seismograph, which reflects the rays into a horizontal slit on the box covering the drum. Behind the slit is a cylndrical lens to converge the rays to a point of light. The drum rotates once every hour and at the same time moves about one-quarter of an inch to the right, so that the point of light traces out a continuous line forming a helix. When the sheet is removed and developed, the record appears as a series of

parallel lines, each line representing a period of one hour. There are short breaks in these lines which are the minute signals. During the end of each minute, by magnetic means, the light is shut off from the lamp so that there is no record for that second. Hence the time of an earthquake can be accurately found from the seismogram.

The vertical seismograph depends on the inertia of a heavy mass supported by a spring. It records the up and down movements of the earth. The vertical displacement is transformed into a horizontal one by a system of levers and is recorded on a sheet of smoked paper. The latter is mounted on a drum which rotates like that of the horizontal instrument, producing a record similar to the same. At the end of every minute the pen is raised off the smoked sheet.

It has been found that the time between the arrival of the P and S waves always bears a fixed relation to the distance of the seismograph from the eipcentre and also to the time of transmission of the shock from the origin. Tables have been constructed from which this distance and time of origin can be determined when the difference of time between P and S is known. The distances from each of three or more stations being known, for any given earthquake, the position of the epicentre (that points on the surface vertically above the focus) can be determined very accurately.

PRACTICAL APPLICATIONS

The one important application of seismology is in prospecting. The existence of oils and minerals is revealed by the seismic records. At times we find minute, regular vibrations in the seismograms, which are not caused by earthquakes. These are called microseisms. Dr. S. K. Banerji has recently discovered two definite types of microseisms in the seismograms in our country, one caused by the monsoons and the other by the storms in the Indian seas. As these microseisms appear in advance, the advent of the monsoons and the storms can be predicted beforehand.

CONCLUSION

We had a rapid journey into the past through the 'dim labyrinthine corridors of time', like Mr. H. G. Wells' Time-Traveller.

We have witnessed vast periods of time during which continents have risen and sunk. We have also witnessed the growth of life through gulfs of time from a mere stirring in the primitive slime towards freedom, power and consciousness. Humanity has appeared in this world only a little while ago, and it has a great future before it.

BIBLIOGRAPHY

Jeans. Sir J.: The Universe Around Us.
Walker. G. W.: Modern Seismology.
Wells. H. G.: An Outline of the History of the World.
Beadnell. Admiral.: A Picture Book of Evolution.
Chamberlin and Salisbury: Geology, 3 Vols.
Jeffreys. H.: The Earth.
Hæckel. E.: The Evolution of Man.
Victor Gollancz Ltd.: Outlines of Modern Knowledge.
Journal of the R. A. S.: Canada ; Vols. 24 and 26.

Dr. Fermor's Address on Causes of the Recent Earthquake

The causes of the recent earthquake were fully gone into by the Conference of Geological Experts which met under the joint auspices of the Geological Survey, the Geological and Metallurgical Society of India and the Calcutta Geographical Society. Dr. L. L. Fermor, Director of the Geological Survey of India, was voted to the chair.

Dr. Fermor, in the course of his Presidential address, observed that on the date of the occurrence of the earthquake, although he was in the heart of Calcutta, he did not feel the shock. He referred at length to the investigations which were being carried on by his department in different parts of Bihar for ascertaining the causes and effects of the earthquake. The President declared that, in his office-room, he had a map of India on which he had regularly marked the intensity of the earthquake shock at different places as reported in newspapers. His method consisted in marking different places with different colours according to the intensity of the shocks. This map of his helped him to deduce that the most violent effects of the earthquake were felt along the strip of country extending from Darjeeling to Motihari and another strip at an angle to it from Motihari to Monghyr.

Continuing, Dr. Fermor referred to the questionnaire sent out by his department for being filled up by witnesses in the various provinces. The President found therefrom that there were some very unusual features. He was therefore issuing a revised questionnaire so as to include details regarding the appearance of fissures on grounds and other damages to the surface of the earth. He announced that an officer of his department had been deputed to examine the southern parts of Nepal.

Dr. M. Chatterjee, Professor of Geology at the Calcutta Presidency College, declared that he felt two distinct shocks with a slight lull between them on the 15th January. He was inclined to locate the epicentral area along the southern border of Nepal.

Mr. T. K. Nair, Mettallurgical Inspector, Jamalpur, then related his experiences. He stated that houses built in rocky areas and on

foundations were able to withstand the earthquake shock etter than those situated on or near the banks of the Ganges.

A VERY COMPLEX ONE

. D. N. Wadia, just returned from an official tour of inspec- und Darjeeling, told the Conference that in his opinion the earthquake was a very complex one. The movement along in boundary fault separating the Himalayan region from the ic alluvium was, according to him, the probable cause. It ed to him from his investigations that there were also some ted faults probably underneath the alluvium, along which dislocations might have taken place. It struck Mr. Wadia as ure to hazard any opinion until the epicentre was definitely ined. Continuing, Mr. Wadia averred that compared with sam earthquake of 1897, the present earthquake "must be red mild". But the epicentral tract in the present instance ed to be much larger. Mr. Wadia proceeding, remarked that ensity of the shock at Darjeeling was not more than eight on ssi-Foral scale and at Monghyr and Purnea not more than otwithstanding the wide area of devastation and destruction. uctures at Darjeeling said Mr. Wadia, had very bad founda- n loose sub-soil, liable to slipping, and were also too besides being badly constructed. He considered that yr houses needed no more than a mild shock to demolish There was another circumstance also, namely, that yr was situated on the fringe of the Gangetic alluvium and ocks. Due to the reflection of earthquake waves from this n and their interference with the incoming waves, the in-

the surface of the earth along a fault plane, thereby causing an earthquake.

Dr. M. S. Krishnan, of the Geological Survey, who guided the proceedings during the latter part in the unavoidable absence of Dr. Fermor, summing up the discussion, emphasised the importance of the part played by the main boundary fault in the causation of earthquake. Extensive fissures of ground in the northern parts of Muzafferpore and Darbangha immediately adjoining the Nepal boundary pointed to that region being the epicentre of the recent earthquake. Further observations especially from Southern Nepal were likely to throw light on the exact location of the epicentre.

Dr. Krishnan opined as likely the existence of sympathetic faults in the trough of the Gangetic alluvium, along which also dislocations were likely. He further pointed out that since alluvium was a heterogeneous mass, " external effects observed do not supply reliable criterion for the actual intensity of the shock at places."

A vote of thanks to the chair concluded the proceedings.

rocky foundations were able to withstand the earthquake shock much better than those situated on or near the banks of the Ganges.

A VERY COMPLEX ONE

Mr. D. N. Wadia, just returned from an official tour of inspection round Darjeeling, told the Conference that in his opinion the recent earthquake was a very complex one. The movement along the main boundary fault separating the Himalayan region from the Gangetic alluvium was, according to him, the probable cause. It appeared to him from his investigations that there were also some connected faults probably underneath the alluvium, along which minor dislocations might have taken place. It struck Mr. Wadia as premature to hazard any opinion until the epicentre was definitely ascertained. Continuing, Mr. Wadia averred that compared with the Assam earthquake of 1897, the present earthquake "must be considered mild". But the epicentral tract in the present instance appeared to be much larger. Mr. Wadia proceeding, remarked that the intensity of the shock at Darjeeling was not more than eight on the Rossi-Foral scale and at Monghyr and Purnea not more than nine, notwithstanding the wide area of devastation and destruction. The structures at Darjeeling said Mr. Wadia, had very bad foundations on loose sub-soil, liable to slipping, and were also too heavy, besides being badly constructed. He considered that Monghyr houses needed no more than a mild shock to demolish them. There was another circumstance also, namely, that Monghyr was situated on the fringe of the Gangetic alluvium and solid rocks. Due to the reflection of earthquake waves from this junction and their interference with the incoming waves, the intensity of the shock seemed to have been augmented in the vicinity of this junction. At Purnea, he found most of the buildings still standing up although the ground had been extensively fissured. The Collector of Purnea had told the speaker that a long time before the actual earthquake, Purnea heard terrible sounds resembling gunshots. These sounds ceased to be heard after the earthquake.

Mr. S. L. Biswas explained the reason for the dislocation along the Himalayan foot-hills on the principles of Isostasy according to which the Himalayas were supposed to be more or less a floating mass and any transference of heavy material from it to the adjoining alluvium tended to buoy up the Himalayas still further and correspondingly push down the alluvium. Thus at the junction of the two areas there was a relative movement at some depth below

the surface of the earth along a fault plane, thereby causing an earthquake.

Dr. M. S. Krishnan, of the Geological Survey, who guided the proceedings during the latter part in the unavoidable absence of Dr. Fermor, summing up the discussion, emphasised the importance of the part played by the main boundary fault in the causation of earthquake. Extensive fissures of ground in the northern parts of Muzafferpore and Darbangha immediately adjoining the Nepal boundary pointed to that region being the epicentre of the recent earthquake. Further observations especially from Southern Nepal were likely to throw light on the exact location of the epicentre.

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A vote of thanks to the chair concluded the proceedings.

News and Notes

With this number commences the ninth volume of the Journal. We take this opportunity of thanking those who have been supporting us all these eight years, showing appreciation of our endeavours. As a result of such help, it was found possible to increase the original size of the journal by more than double and introduce improvements such as linotype printing, etc. But our finance are not satisfactory yet; and we appeal for fresh enlistment of members—both journal and non-journal. It is hoped that existing members will also help in this direction.

* * * * * *

In spite of the efforts of various agencies and authorities all the long years, the elementary schools and the lower classes of secondary schools have not been touched at all by the new ideas about geography and the teaching of the subject. Not only has the foundation of geographical knowledge for the higher school thereby weakened a good deal but also thousands of pupils whose only chance of obtaining geographical ideas is in the elementary school only now go without a proper knowledge or training in the subject.

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The best way of changing this undesirable state of affairs is by manning the elementary training schools with teachers who have had a training in the modern methods of handling the subject. If that is not possible, the next best thing that may be suggested is *a vacation course in Geography* for the teachers of the several training schools. It is hoped that the Department of Education would be able to find the finance for it and arrange to organise the same as early as possible.

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Meantime, the local authorities and the inspecting staff can arrange for *Refresher Courses* for teachers of elementary schools within their jurisdiction. Such a course was arranged during the first week of May at Bhavani by the Deputy Inspector of Schools Erode Range for the benefit of the teachers of elementary schools in Bhavani Taluq, who were collected together and given about a week's course in some of the school subjects including Geography. The last was done by the Secretary of the Association.

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But the teaching in the first three forms of secondary schools is in no way better; and all the recent efforts for reform in geography teaching have been directed towards the improvement of the high school teacher only, so that they have not produced any appreciable results in the middle school. It is still the plethora of fact lore that is dumped on the poor innocents without any attempt at giving the outlook or the training or the foundation. It is hoped that the syllabus and the suggestions which are now on the anvil will, when published, go some way towards improving conditions. But the more important lever for improving conditions here also is to give special training to the teacher in this direction. Hence it has been decided that the Summer Schools and Refresher Courses in Geography conducted by the Association should for some time be preferably for the middle school teachers rather than for the high school teachers.

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Things have been rapidly changing in the High School. Before the remodelled S. S. L. C. Scheme had been in force for a couple of years or so, it has again been changed, affecting the position and importance of Geography to a considerable extent. Theoretically no doubt Geography enjoys in the new scheme the same place that is accorded to History, Science or any other long established subject of the high school curriculum except of course Mathematics and the Languages. But owing to the fact that Geography has not been provided for in the intermediate course in any men's college and only in one woman's college, and owing to the need for equipment in Geography more than in History or Language (the other two alternative subjects in the same group), very few schools are likely to provide for the teaching of Geography as a C-Group subject. The net result will be the practical exclusion of Geography from the higher classes of the high school—a strange reaction not contemplated or anticipated when the new scheme was ushered in. The last geography for most pupils will consequently be what they learn in the IVth form. It is for educationists to consider whether a subject like Geography, which is of such high value for citizenship and discipline, should thus be practically excluded from the higher classes of the high school. Our experience regarding the teaching of B-Group subjects has been sad. It is hoped that Geography in Form IV may not share the same fate as before.

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When five colleges were compelled by the University to give up the teaching of Geography in the Intermediate classes, it was

shearing in New Zealand, Tractor and Multiple-plough in the Canadian Prairies, A Steam Threshing Machine in the Ukraine, Hoeing a Beet Field in Germany—all these present a rich variety and comprehensiveness of man's work in distant lands. The prints are of fairly big size, clear, expressive and attractive; and their value is considerably enhanced by the descriptive letterpress given under each picture. We have no hesitation in recommending their general use in schools to make the teaching of Geography realistic and effective.

The Geography of India Through Maps: By Phyllis Seymour Darling, M.R.S.T. English and Tamil editions. Price As. 6. (Christian Literature Society for India, Madras).

The English edition of this useful little book was reviewed in a back number (Volume VIII, No. 1) of this Journal, from which we freely quote below:—"This is a companion volume of practical work to Miss Birdseye's *Our Country*. It has been prepared with the threefold purpose of (1) making the pupils appreciate the significance of geographical facts by working at given data; (2) giving the pupils training in map-work as the basis for future geographical study; and (3) affording a sound knowledge of the geography of their mother land. The book can also be used where modern methods of individual work are practised. An important feature of the book is the detachability of the maps, which makes map correlation easy and convenient. The outcome of the use of the book will be to supply the pupils with text-books, containing records of their own work. We would strongly recommend the adaptation of it into the South Indian vernaculars, if it is to come into general use." We are glad to note that our suggestion has been acted upon, and a Tamil edition of it has been produced, which we are sure will be used in all Tamil schools.

Bulletin of the Madras Government Museum—Tiruparuttikunram and its Temples: By T. N. Ramachandran, M.A. (Superintendent, Government Press, Madras), Price Rs. 11-4.

This is a detailed and comprehensive study of two Jain temples on the outskirts of Conjeeveram, the great city of Tondaimandalam through the ages, Madras taking its place only in quite

modern times. From one point of view, the history of Conjeeveram is practically the history of religion, art, architecture and culture in South India. Of the two temples, the smaller is in late Pallava style, and the larger early Chola with a mandapa in Vijianagara style. " They thus supply an epitome of the main features of the chronological development of Dravidian temple architecture which so far as is known is found nowhere else in so concise and well-balanced a form." After a detailed consideration of the several parts of the two temples, Mr. Ramachandran has discussed the inscriptions and paintings in them, and has added three valuable appendices on Jain units of measurement and time, cosmology and classification of souls. The volume is quite a scholarly work and is the outcome of considerable research.

Books and Journals Received

Practical Map Books: By S. J. B. Whybrow. Books 1 and 2. (J. M. Dent & Sons, Ltd., London).

W. & A. K. Johnston's Geographical Pictures: Set. I. Cool Temperate Lands. (W. & A. K. Johnston, Limited, Edinburgh & London).

Geography of India Through Maps: By Phyllis Seymour Darling. Tamil and English editions. (Christian Literature Society for India, Madras).

Bulletin of the Madras Government Museum—Tiruparuttikunram and its Temples: By T. N. Ramachandran. (Superintendent, Government Press, Madras).

Scottish Geographical Magazine—March 1934.

The Indian Review—February, March and April 1934.

The Educational Review—February, March and April 1934.

Kalaimagal—February, March and April 1934.

Wealth and Welfare—January, February and March 1934.

The Geographical Review—April 1934.

Journal of Indian History—December 1933.

The Geographical Journal—February, March and April 1934.

The South Indian Teacher—February, March and April 1934.

The Gardening Review—February, March and April 1934.

Quarterly Journal of the Mythic Society—January and April 1934.

Geography—March 1934.

Journal of the Travancore Teachers' Association—February 1934.

The Indian Educator—February, March and April 1934.

The Presidency College Geological Magazine—March 1934.

Journal of the Andhra Historical Research Society—October 1933 and January 1934.

Indian Journal of Economics—January and April 1934.

Our Home Magazine—April 1934.

The Himalayan Journal—Volume VI, 1934.

Mitteilungen Der Cesellschaft Fur Erdkunde Zu Leipzig—1931-32.

The Journal of
The Madras Geographical Association

Vol. 9 July 1934 No. 2

Valedictory Address to the Teachers' College Teachers' Association

BY

MISS J. M. GERRARD, M.A.,

This occasion, the 1934 valedictory meeting of your Association is not a little tinged with gloom, for the future position of Geography in the school curriculum is very uncertain. By the recent resolution of the Academic Council relating to the revision of the S.S.L.C. Course, Geography has been swept out of the important sphere of compulsory subjects, jettisoned to the fate awaiting those optional subjects which held no pass key to the exclusive groups of the Intermediate Course. The future holds little for you, Geography students, who were looking forward, I am sure, to doing some teaching in a subject which must have captured your interest with its vitality and enthraling vistas and widening contacts. To us of an older generation who struggled for many years before getting it recognised as one of the essential subjects, the change brings with it some of the bitterness of defeat. We are back again at the old position, with Geography no longer taken seriously in the upper school, except when offered as an optional subject, and the chances of that seem remote. It is difficult to prophesy at the moment; there are faint hopes that it may become a popular combination with the science group and also with commercial subjects. If Geography could be included in the Science group, as well as in the History Group, where it is placed at present, there would result the possibility of a more valuable combination of subjects than the scheme can offer as it is. For what could be better than the intensive study of two subjects with completely different methods and content and outlook, yet each enriching the study of the other? I am perfectly sure that as regards their scope as *school*

subjects there is more possibility of scientific method in the treatment of school Geography than in the treatment of school Physiology, and that it has on that account more claim to be placed in the science group. There is indeed no reason why there should not be two different Geography syllabuses, each appropriate to the group in which it is included.

Every cloud has its silver lining, however, and from the point of view of the better teaching and development of the subject the outlook has some cheerful possibilities about it. Let us consider the present position for a moment. For three years Geography has enjoyed the advantage of inclusion among the compulsory subjects, and one assumes that it has, on that account, received the serious attention of teachers—that it has in fact been given a " square deal " to enable it to justify its important place in the curriculum. This is far from being the case. In the first place, the syllabus is not satisfactory; it is the emasculated remnant of the original syllabus prepared by the Geography sub-committee and opposed by all the members of the S. S. L. C. Board but one. And our chief enemies in that battle were our History colleagues who were in a large majority and who knew just enough of the subject to realize its usefulness to history, but not enough to grasp the significance of Modern Geography, which has a purpose and an aim and a cultural value of its own. We might say it was the machinations of the History speclialists that gave Geography only a one-third share of the time allotted to the linked subjects, of History and Geography, and that limited the final examination (on the Geography of the whole world) to one meagre hour. The effect was to crowd out the subject, and since it was possible for the pupil to obtain a passing mark in the combined subjects, with no marks in Geography, the harassed schools were only too glad of the opportunity to adopt a " laissez-faire " policy in regard to one subject which higher authority implied was less important. The result was, of course, that little attempt was made to ensure that it was being taught by persons with some inkling of the aims and methods of Modern Geography. It is not surprising, therefore, to hear complaints on all sides that the subject is being badly taught. It is in any case one of the most difficult to teach; and while the groping enthusiast, even if he begins with no back-ground of geographical knowledge, can do little serious harm, the indifferent and ignorant teacher can, in my opinion, do a world of harm. It is just as pitiful to see the regional sequence treated with no imagination and in a stereotyped way as to observe a lesson of the " capes and bays "

method. It is exasperating to listen to pupils using terms like irrigation, agriculture, water-power, etc., without the faintest glimmering of the processes involved and the part played by man; one knows at once that there has been no attempt to build up the geographical concept implied in each; and it is positively tragic to come across evidence of bad habits of thinking—superficial generalisation, particularly. This is the danger of Geography, when *not* taught properly—it is apt to encourage *loose thinking and bad habits* of inaccuracy and slovenliness. We must face the fact that there has been a great deal of poor teaching during the last three years.

That then is the position at present, not so cheerful that we want to retain things as they are.

The trouble with our Geography teaching is that we have begun at the wrong end, rather we have begun at one end, the top, and forgotten all about the bottom. We must concentrate now on *the teaching of Geography in the lower school*, and in the training schools. The Madras Geographical Association can do a great deal in stimulating a real interest in the subject among secondary and *elementary teachers, just as it has done among graduates.* It can also help by giving guidance, and one of the first obstacles to be cleared away is the standardised syllabus. It is all wrong to believe that there must be a uniform Geography syllabus throughout all schools in the Presidency; it might make it easier for the inspecting authorities, but it is a barrier to good Geography teaching. One reason is that the uniform detailed syllabus rules out completely " Home Geography ", which should be the very fabric of the course. The Geographical Association should work out more than one type of ' approval ' syllabus and should encourage schools to prepare syllabuses on *similar* lines, each modified according to the individual needs of the school. There is great opportunity here, for with no compelling and cramping examination at the end of the middle school, there is plenty of scope for *experiment* and for individual development in each school in harmony with its particular environment and the nature of the human material composing it. Teaching syllabuses in Geography should be planned with a due proportion of " Home Geography " and " Geography of the world " in each stage; and the difficulty is you can't finish off any one aspect at any one stage, but each must find its place concurrently with the other up through the grades, from class III to Form VI. One of the reasons for the deplorable teaching in the junior classes is the nature of the syllabus set, which is

founded on a principle no longer accepted as either sound or practicable as far as syllabuses are concerned. "From the known to the unknown" was once upon a time considered an excellent guide in determining the sequence of regions to which the pupil was to be introduced. It was developed into the idea of "first the village, then the taluk, the district, the country and finally the world". This is quite dead now. Its impracticability has been realised, for it has been found impossible to arrange for a sequence of geographical ideas in their order of difficulty to fit into a scheme of this type. The geographical story *must* be the beginning, and you can't find such stories with the taluk as the back-ground—it has to be the world. So, we must begin with the world as the back-ground of the story, and at the same time there must be an awakening to simple geographical things in the immediate environment.

As a matter of fact also, we have realised, when trying to put into practical effect, that what is beyond the horizon by a few miles is generally as little known as if it were thousands of miles away. The farther part of the taluk is likely to be far less known to the young pupil than places with the magical names of Delhi, Bombay and Calcutta; it is pretty certain to be also, from a geographical point of view, deadly uninteresting. There is nothing geographical in the determination of the boundaries of taluk or district, so it is not even a geographical region. By "Home Geography" therefore is not meant taluk geography; and so when we set the Geography of the Taluk as the syllabus for class 4, we are going against the fundamentals of Geography as well as the fundamentals of Psychology. We cannot dispose of Home Geography by taking the Home Region all in a gulp, as it were. For whatever purpose we teach it, for its own sake or because it provides the best laboratory in which the child can build up, by observation and experience, his geographical concepts, the Home Region must be studied a bit at a time. And in each year of the course a certain proportion of the syllabus must be devoted to the study of the Home Region. It has to be woven into the syllabus so that it fits with the progression of geographical ideas and geographical skills, so that it is the back-ground of the whole syllabus from Class 3 to Form VI. The prescribing of a *detailed uniform* syllabus, particularly in the early stages of school Geography, inevitably kills the attempt to teach the Geography of the environment in a rational way. What we require is an outline syllabus emphasizing the general ideas to be taught, merely laying down the condition that the whole world should be covered at least once in the school course, and permit-

ting each school to design its own *teaching syllabus* in Geography up to Form IV. If we do this, if we try to encourage enthusiasm for the subject in the secondary training schools, guiding the Geography enthusiasts along the lines of practical and observational Geography, we shall soon begin to have little nucleii of good teaching centres, which will gradualy increase in size and influence, until in time the good work will permeate all the schools and the standard of Geography teaching will reach a plane which we know to be possible, although immeasurably high above our heads at the moment. And so this apparent set-back, which Geography has had, in being thrust out of the lime-light of the compulsory group, will, if we realise this opportunity of building anew, result in an improvement in the teaching of it and therefore develop its educational value as a subject in the curriculum. And meanwhile we shall have time to consolidate our position, and to strengthen our numbers before attacking the formidable obstacles that lie in the way of the development of the subject in University studies.

It is cheering to remember also that there are other factors working on the side of the protagonists of Geography. One of them is the increasing demand for geographical knowledge in present day life. Mackinder in a presidential speech to the Geographical Section of the British Association pointed out that it was not wholly by the initiative of the learned societies that the change came about in the higher study and teaching of Geography, but that it was due in no small degree to public demand. There is an amusing reference incidentally in that speech to his first lecture as University Reader in Geography at Oxford over 44 years ago : he had an audience of three, one man and two women. The man was a Don who told the young Geography Reader that he knew the Geography of Switzerland because he had just read the guide-book of that country from cover to cover ! The two women brought their knitting ! Nowadays there is developing an increasing number of occupations in which a knowledge of Geography is necessary and desirable—from the town-planner to the man in business. Geography is also one of the most useful of subjects in helping to develop the *international spirit.* We have only to look around us to see the importance that is being attached everywhere to the engendering of this attitude in schools, and also in grown-up communities. One of the most notable features to-day in education is the increasing number of organised visits of school-boys and school-girls to other parts of the world, all carried out by the teachers and the school authorities. From England

to Europe, to Asia, to America, and even Australia, parties of boys and girls set out every year ; and among the countries of Europe itself the systematic exchange of groups of boys and girls has developed to an amazing extent. The League of Nations has realised the importance of Geography in this respect, and has brought out a new pamphlet entitled "Geography Teaching in regard to World Citizenship". To the Geography teacher much in this pamphlet appears commonplace; so little is new, simply because there has always been in the teaching of Geography this tendency to internationalism.

There are certain difficulties prevailing in this Presidency, which make improvement in the teaching of the subject impossible; and it is the business of Geography enthusiasts to overcome them. One of these is *the dearth of attractive story books* with a geographical back-ground suitable for Indian boys and girls. I remember the joy I used to find as a school-girl reading the adventurous stories of Henty and Ballantyne, and a series entitled "The Three Midshipmen", "The Three Commanders", "The Three Admirals", describing the adventurous careers of the same three boys in the Royal Navy. These story-books carried one to all parts of the world, they thrilled with their sense of adventure, and they were invaluable aids to the learning of Geography out of school hours. Why can't you Geography students produce such story-books—all about Indians and their adventures in different parts of the world? The material is there if you would only delve for it. What could be more thrilling than a tale of the "Pundit Explorers"—men of the Indian Survey who travelled in disguise in perilous hostile places, mapping secretly as they went? "They would leave on their journeys and disappear sometimes for years, re-appearing unexpectedly with the geographical knowledge so laboriously collected. They counted their every step by the revolution of prayer wheels, or by the beads on their rosaries. At night they would write their notes on a roll of paper inside the prayer-wheel. They recorded compass bearings of mountains and rivers passed, by means of little compasses cleverly disguised as amulets worn round their necks. They carried boiling-point thermometers inside hollow walking sticks for the measurement of altitudes." Hari Ram and Kalian Singh and brave Kintup—they deserve to have their names perpetuated in thrilling story, and what a splendid geographical setting their adventures would make! Why are there no stories rich in geographical detail of the early Hindu colonisers in Java and Angkor, of the Arab traders that made Peninsular India their highway from Canton to Basra? A certain amount of re-

search, some attention to the form of the story, and a vivid and fairly accurate description of the dangers encountered and overcome—and you can produce a book that will be bought by every school. And incidentaly there is a lucrative career awaiting those of you with the gift for writing and the perseverance to study the geographical detail.

Another serious handicap is the lack of cheap large scale maps. Every secondary school should have a series of maps of the school locality on scales such as 80 inches to the mile, 20 inches to the mile and the one-inch map. Three maps of this type in England would cost under ten shillings. My estimate for three similar maps for the area round the Lady Willingdon Training College comes to Rs. 76 ! The trouble is that one has to buy from the Survey Department a complete set of maps because they are not sold separately—e.g., a complete set for the Mylapore division costs Rs. 48, while only one is required for the school's puropse. The prohibitive cost of maps, and for some places the lack of suitable maps makes it very difficult for teachers to teach *Home Geography* successfully. It is up to the Geography teachers, through the medium of the Geographical Association to prevail upon the Survey Office to consider the needs of the schools in regard to maps.

Another serious handicap is the kind of Geography text-books that is being poured on the market at present. There are dozens of text-books written by people who have hardly a bowing acquaintance with the aims and principles of Modern Geography and who are certainly ignorant of the theory of the psychological approach to learning in the early stages of the school course. I am afraid these text-books will do a great deal of harm. Now that Geography takes a back seat again there is a hope that these hastily compiled text-books will stop appearing, and that we shall have more of the typé of text modelled on the lines of the best Geography text-book writers like Leonard Brooks and " Fairgrieve and Young," written in the vernacular and carefully produced.

Let me in conclusion, quote a pertinent passage from an English essayist, C. A. Montague, as a warning to all Geography teachers and an incentive to text-book writers ! The occasion is a review of Mackinder's " Britain and the British Seas " : —

" Only now do many of us begin to see how well they kept from us at school the secret of the joy of finding how the earth

works. Some of us once had it and from them it was firmly taken away. They were born of the kind that pries young, asking when they play on sands, why there are tides, or what goes on in the sky that there should ever be rain. These are they that 'have to be plucked out of the earth' for lesson times, 'rank of the soil like roots' to learn from books what a bore their dear earth can be, with her strings of names of towns, rivers, and lakes, her mileages, her insufferable flax and jute. Pastors and masters are indomitable men, at least they were. To make large and gray book of fairy tales, the earth, dull and stale to a child importunately fingering at its covers was a task to daunt the strongest. They did it so well that many of their charges, if ever they had a hearty bite at these Eve's apples in the rest of their lives, only got it by accident. They may have been climbing the Alps and heard the unexpected detonation of a fall of rock crashing into the silence of the snow-fields, and in that instant a whole range of fascinating fact was rescued from the triteness that had put a bar between it and their minds; for the first time they really knew how all night the frost had been driving its wedges into the granite of the peak till the sun came to draw them out, and send down the spitting stone, grinding itself to shale, to mix with the made earth in the valleys. They are in the very forge at last, with their own bodies shaken by a visible fall of the hammer at work in an unfinished world, and for the first time a living knowledge of these things rushes in upon their minds in a flooding miracle of enjoyment. To those who were taught in the old way the reading of a book like Mackinder's is a downright revelation. Geography was dry bones and behold! the dry bones stir; they give praise . . . . Everywhere you are captivated by some striking generalisation that seems as if by magic to shake into their right places whole masses of detached phenomena, easily fixing in position as normal details of larger wholes such seeming freaks as the lie of the rock at the top of Ben Lawers or the dots of coal in Ireland, the make of Portland Bill or the medley of tides in the Straits of Dover. To the middle-aged who parted with Geography in anger she comes again with rejoicing, bringing her sheaves with her".

Secondary School-Leaving Certificates
1934 Scheme

Group B.

Geography for Form IV.

Syllabus—A Geography of India.

I. *The World as a Globe.*

Location on the globe by means of latitude and longitude; and the world position of India. Determination of the latitude of a place by Pole Star and by the Sun. Longitude and time; local time and Indian standard time. (3)

II. *The Topographical Map.*

The meaning of scale; representation of relief by contours and typical contour forms; study of the 1″ map of the locality (in the field as well as in the class room.) (3)

III. *Rivers.*

The work of running water with special reference to the local stream or river; the typical course of a river; the chief rivers of India studied in relation to the relief, their courses, basins and relative importance. (2)

IV. *Rocks.*

Weathering and the formation of soil; the common rocks and soils of the locality and their common uses. Minerals and mineral oils in India—their distribution and economic uses. (2)

V. *Climate of India.*

The apparent migration of the sun; its cause and its effect upon temperature and length of day. Temperature conditions in India; the effect of altitude and proximity to the sea studied with reference to actual temperature graphs of characteristic places in India; temperature maps of India.

Rainfall conditions in India studied with reference to rainfall graphs for each of the characteristic rainfall regimes; causes and

types of Indian rainfall; rainfall maps of India; causes of the monsoons; formation of cyclones in the Bay of Bengal. (4)

VI. *Natural Vegetation of India.*

Its distribution studied in relation to relief and rainfall; forest areas and chief forest products. (1)

VII. *Irrigation.*

The water-table and well irrigation; irrigation by means of rivers, flood and perennial irrigation. Irrigation systems of the Cauvery, Periyar, Indus and its tributaries, Upper Ganges. (2)

VIII. *Cultivated Crops.*

Distribution of local crops in relation to soil areas and availability of water; the cultivated crops of India, their distribution and relative importance in each area. (2)

IX. *Distribution of Population.*

Study of the distribution of settlements as shown on the one-inch ordnance survey map of the locality; the density of population in India in relation to relief and rainfall; distribution of people in India as regards races, religions and languages. (2)

X. *A Detailed Study of each of the following Natural Regions of India:—*

(a) The Himalayas—their formation and characteristic zones of vegetation.

(b) The Indus Plains—their dependence upon irrigation.

(c) The Ganges and L. Brahmaputra Basin—the relation between rainfall and crops.

(d) Ràjputana and Central India—a transitional zone.

(e) The Deccan—the lava region of the N. W.; the N. E. region of the Upper Mahanadi and Chota Nagpur; the Southern region of ragi and millet.

(f) The West Coast Region—the formation of its coast-line and backwaters.

(g) The East Coast Region and its deltas. (9)

XI. *Political Divisions of India.*

The Madras Presidency—its districts, towns and communications. Provinces and States of India—their boundaries in relation

to relief and natural regions, their capitals and inter-communications. (2)

XII. *Growth of Settlements.*

The chief sea-ports of India and their hinterlands. The chief industrial towns, nodal towns, religious centres and Hill stations of India. (2)

XIII. *The Trade of India.* (1)

B. World Studies.

XIV. Monsoon lands and the causes of their world distribution, with a study of China and Indo-China as a type of this region. (2)

XV. Equatorial forests and grass-lands and the causes of their world distribution, with a study of the Congo Basin and Anglo-Egyptian Soudan as types. (3)

XVI. Temperate forests and grass lands and the causes of their world distribution, with a study of the following types—Scandinavia, Denmark and the prairies of N. America. (4)

XVII. Mediterranean lands and the causes of their world distribution, with a study of Mediterranean Europe as a type (2)

XVIII. Deserts and the causes of their world distribution, with a study of Egpyt and the S. W. lands of Asia as types. (2)

XIX. The chief industrial regions of the world in relation to the supply of iron, coal, water power—a study of the industrial areas of Britain and Europe, U.S.A. (Lake Belt, Pennsylvania and New England States) and Japan. (7)

XX. *Lands of Indian Emigrants.*

Burma, Ceylon, Malaya, S. Africa, Kenya, British Guiana and Fiji. (2)

XXI. *World Routes.*

Ocean highways; trans-continental railway routes; air routes from India to Europe and Australia. (2)

XXII. *India's World Trade.* (1)

Total 60 lessons.

NOTE:—The figures in brackets suggest a distribution of lessons to each section, but it is not the intention that these must be strictly adhered to.

LIST OF BOOKS

S. S. L. C. Scheme—1934.

Form IV.—Geography Books Recommended

For Teachers :

The World About Us—Howarth—Oxford University Press.

Man and His Work by Herbertson, published by A. & C. Black.

Outdoor Geography by Hatch—Blackie & Sons—Rs. 2.

Surface of the Earth by Pickles, published by Cambridge University Press.

Provincial Geography of India.

Bengal, Behar and Orissa—L. S. S. D'Malley, published by Cambridge University Press.

Madras by Thurston, published by Cambridge University Press.

United Provinces by Sir J. Doine, published by Cambridge University Press.

Imperial Gazetteer of India—Vol. I, published by Oxford University Press.

India's Mineral Wealth by C. Brown, published by Oxford University Press.

Forests of India by Smythes, published by Oxford University Press

A Class Book of Practical Geography by Young and Fairgrieve published by G. Philip. Re. 1-12-0.

Experimental and Open Air Geography by A. Wilmore, publishec by Bell. Re. 1-4-0.

For Pupils :

I. Text-books : There is no one text-book at present whicl includes both parts of the syllabus—

1. Longman's Regional Geographies of India by L. Dudle} Stamp, published by Longmans Green & Co., Pt. IV—Indian Empire—Rs. 1-8-0,

2. Geography for High School Classes by N. Subrahmanyam, published by The Indian Publishing House—Pt. 3—India.

3. Regions of the World, Book III by Barker and Brooks published by The University of London Press.

II. *Practical Work*:

(a) Survey of India map, scale 1″ to 1 mile of the Home Region (to be selected from the Survey of India Catalogue of 1″ maps) price unmounted Re. 1-8-0 each.

Note:—Every school should have the one-inch map of its own home region because this is the reference for all the local geography taken in the school course. It is desirable there should be at least 1 map to every two pupils in Form IV; it might be possible for school to supply the requisite number, recovering the cost over a period of years, by charging each pupil using these maps a small fraction of the cost.

(b) Longman's Geographical Exercise Book for India by D. & E. Stamp, published by Longman's Green & Co.,
Pt. I—Map Reading Exercises, As. 12.
Pt. II—Climatic Exercises, As. 12.
Pt. III—Graphical & Regional Exercises, As. 12.

III. *Atlases*:

(a) Longman's Senior Atlas for India, edited by G. Philip, published by Longmans Green & Co., Rs. 2.

(b) The Taj Mahal Atlas by G. Philip, published by Longmans Green & Co., Re. 1-5-6.

(c) The Indian School Atlas, edited by G. Bartholomew, new and revised edition, published by The Oxford University Press.

IV. *Pupil's Reference Library*:

(1) Man and His Work by Herbertson, published by A. & C. Black.

(2) World Communication by Land and Sea and Ocean by Sweeting, published by Nisbet, Rs. 2.

(3) The World at Work by H. R. Sweeting, published by Nisbet, Rs. 2.

S. S. L. C. 1934 SCHEME

Group C.—Geography Syllabus.

1. A regional study of the world aiming at the knowledge and application of fundamental principles rather than an accumulation of detailed information about various regions.

2. A detailed regional study of a special region outside India, to be prescribed each year. This will be either a major natural region or an important country.

3. A detailed study of the local area (approximately an area of not more than 10 miles radius from the school). Opportunity should be afforded for direct observation and practical work in the field, and the emphasis should be placed upon the influence of the physical factors upon the life and activities of the people.

N. B.—It will be assumed in setting the papers that practical work has been done along the following lines: Weather observations and records and their representation; elementary map making by chain survey; map-reading including all varieties of maps and the drawing of sections; construction of diagrams, etc., from data; observation (in the field) of effects of weathering and the work of running water.

S. S. L. C. SCHEME, 1934: LIST OF BOOKS

Geography Books Recommended for Group C.

For Pupils:

I Text-Books:

A Geography of the World by Howarth & Bridewell, published by Oxford University Press.

The New Regional Geographies by L. Brooks, published by University of London Press, Bk. IV., The World.

The World—a General Geography for India Schools, by Dudley Stamp, published by Longmans Green & Co., Rs. 3.

II. Atlas:

Longman's Senior Atlas for India, edited by G. Philip, published by Longmans Green & Co., Rs. 2.

III. Reference:

The Rambler Travel Books, edited by L. Marsh, publisned by Blackie & Sons.

For Teachers: Reference:

An Intermediate Geography of the World by D. Stamp, published by Longmans Green & Co.

A Class Book of Practical Geography by J. Fairgrieve, published by G. Philip & Sons.

Practical Geography by Unstead, published by Oxford University Press.

Outlines of Physiography by Herbertson, Oxford University Press.

Principles and Practice of Geography Teaching by Barnard, published by University Tutorial Press, Rs. 3-8-0.

Practical Geography by Unstead, published by Oxford University Press.

An Experimental Geography by Wilmore, published by Bell, Re. 1-4-0.

A Graded Course of Geography by E. S. Price, published by G. Philip, Books. I—IV (Excellent for method).

Hints and Comments on the IVth Form Syllabus in Geography

BY

MR. N. SUBRAHMANYAM, M.A.L.T., F.R.G.S.

There may be a good deal of difference of opinion between the advocates of compulsion and of option regarding the proper place of Geography in the High School curriculum. But we do not propose to discuss that question now; but, accepting the position accorded to it in the present scheme, we proceed to explain and comment upon the aims and ideas behind it and to give suggestive notes as to the right ways of handling it.

This syllabus seems to have been prepared with three aims in view, namely: (1) to serve as a coping stone for Middle School Geography rounding off that course; (2) to serve as a purposeful course, useful in later life for the bulk of the pupils who will naturally drop the subject in the Vth and VIth Forms, if they happen to specialise in some other subjects, and for whom it will be the last Geography; and (3) incidentally to serve as the basis of specialised work for those pupils who take Geography as an option in the Vth and VIth Forms.

These three aims are attempted to be achieved by including in the course (1) the Geography of the mother-country, (2) with principles of World Geography interwoven and applied therein as work for two terms; and (3) World Studies, to serve as a complement to (1) and (2) as work for the third term.

At present the Geography of India is learnt descriptively in rather a meagre outline way usually in the First Form, owing to the inability of the pupils at that age to comprehend the correlation of the various geographical factors concerned in the study. In the first three forms at the same time the regional geography of the world is gone through, when necessarily the several principles of world geography are learnt concretely and inductively. To round off this world study it is now desirable to learn at least in the IVth Form the Geography of India more thoroughly than was possible in the 1st Form and with a better comprehension of

the underlying principles which have been learnt concretely in connection with the regional study of the continents in the lower forms. These principles are now not only incidentally revised, but their significance is more fully comprehended as they are linked with the personal knowledge and experience of the Geography of the Home Land and the Home Region. Hence, the very important innovation in this syllabus of emphasising the Geography of the Home Region. No doubt a teacher of Geography, who has been properly trained in the pedagogy of the subject, knows that the Home Area is *the laboratory of direct geographical observation,* and would correlate the study of Geography with that area as often as possible, whether it is so mentioned in the syllabus or not. But, because in the actual handling of the subject, this elementary principle of teaching has so often been lost sight of, it has been found necessary to put into the syllabus points for direct observational study in the Home Region; and the one-inch map of the home area of the school has been introduced as an indispensable aid in this study. Hence, the Geography of the Home Country and of the Home Region are interwoven with the principles of Geography. It is needless to say that the teaching methods should be practical as far as possible, and that plenty of practical exercises given to the pupils in the course of the teaching.

The second part of the syllabus, which is to be done in the 3rd term, contains for the most part studies of the major natural regions of the world in rather a selective way as a compromise for want of time. The distribution of each of the regions with the causes of such distribution is first learnt; and this is followed by a detailed study of the most typical or the most significant example of that region. After the selected regional studies are finished, the following three topics—Lands of the Indian Emigrants, the World Routes and India's World Trade—round off the work of the year by linking the first and second parts together.

Let us next pass in review the several topics in the syllabus, and give a sort of a running commentary on some of them, suggesting the proper way of handling them.

I. *The World as a Globe.*—Under this head the one topic that may be considered somewhat tough is the determination of the latitude of a place from the sun. It has been tried in the class and found to be easily intelligible for the pupils, if the proper approach and sequence are followed. Their personal knowledge

from experience of the sun's apparent path in the sky at mid-day in the different seasons should be recalled and expressed diagrammatically; and the place chosen may preferably be the locality of the school. The geometry involved in the diagram is very simple and elementary, and already known to the pupils. The following sequence of cases is suggested as being properly graded: (a) pole star case, (b) sun at the equinoxes (treated as the converse of the former case), (c) sun south of the equator, (d) sun north of the equator but south of the place, and (e) sun north of the equator and north of the place. This order may be usefully adopted for any school in South India, which lies between the Equator and the Tropic of Cancer. Two periods should more than suffice for this topic; and one period may be given for the rest of the points under 1, most of which would already be known to the boys; and it is only a question of gathering together.

II. *The Topographical Map.*—The idea of scale is also nothing new; and boys may be shown maps of different scales and given a few exercises thereon such as finding distances between places, etc. The conception of *contour* is basic in the study of relief. The frequent and earlier use of the colour relief map obscures the existence of contours in it; and colour is often thought to be of the essence. This wrong notion should be corrected, for example, by getting the pupils to appreciate the topography of a contoured area first, and then colour the same approximately, when the contour will be found to be the boundary between any two adjacent colours.

The one-inch map of the locality is a mine of useful and accurate information; and its use cannot be too strongly recommended in field study along with observational work. It should be a matter of pride for every pupil to own his own copy of the one-inch map of the home area, as he does his own atlas or dictionary.

III. *Rivers.*—This section does not call for any remark except to state that the field study of the local stream may usefully be accompanied by the use of the one-inch mhp.

IV. *Rocks.*—Under this head the relative importance of the productive areas of the minerals may be brought out by statistical comparison and preferably by diagrammatic representation also.

V. *Climate of India.* Here plenty of practical exercises on maps and graphs may be given. The inclusion of 'cyclones in the Bay of Bengal' has been misunderstood by some teachers. It is not

expected that the boys should know thoroughly the physical geography of cyclones. But they are to have a working knowledge with some understanding of the underlying principle of what is such a familiar phenomenon in South India within their everyday experience. It would be a pity if they do not get an elementary knowledge of how, under what conditions and in what seasons they are formed in the Bay of Bengal, and how they cross the coast and the peninsula, giving usually general rainfall and sometimes causing destruction of varying degree especially to places near the coast along their track.

VI. *Natural Vegetation of India.* Under this head, the types of forests according to the amount of rainfall as well as the change of vegetation with altitude should be brought out. There is also what is technically a forest with 'R. F.' boundary pillars erected in a dry scrub jungle area under the jurisdiction of the forest department. Though marked green on the one-inch map, its true nature should be explained to the pupils from local examples. The use of the forest for the agriculturist by supplying leaf manure and affording grazing grounds should not be lost sight of.

VII. *Irrigation.* The local irrigational methods should obviously form the basis of study; and here again the one-inch map may be correlated with observation on the field.

VIII. *Cultivated Crops.*—Here the cycle of crops in the same field in relation to the seasons should also be noted in addition to their general distribution according to level and availability of water. The importance of slope control, which reduces itself to moisture control, of crops may be explained in the field.

With regard to the crops of India, there may be some preliminary indication here as to which of the crops are mostly locally consumed (for example, millets) and which are largely exported (for example, wheat) and whereto, though this aspect will be studied fully later on under 'Trade of India'.

IX. *Distribution of Population.*—The most impressive method of bringing home to the pupil the relative distribution of population in the home area is to observe the country round from an eminence, and compare the idea thus obtained with what is indicated on the one-inch map. For India the population map is the basis of study; but statistical comparisons will be found interesting.

X. *The Regional study* under each of the seven heads would of course include a correlated study of the crops and industries of the several regions along with the physical conditions of surface, soils, climate, etc. The characteristic and peculiar features, physical and human, of each of these regions should be fully brought out, and compared and contrasted wherever possible. Sketch-maps should be freely used in this connection.

XI. *Political Divisions.*—A more detailed knowledge of South India is expected than of the rest of India for obvious reasons.

XII. *Growth of Settlements.*—The relative importance of the several chief towns should be brought out by means of population figures. The relative size of the towns can be represented on a population map by appropriate symbols.

XIII. *The Trade of India.*—Regarding the chief imports and exports the use of bar, circular and other diagrammatic methods of representation are recommended in order to bring out the relative importance of the different commodities as well as the areas of supply and the markets.

B. *World Studies.*—Here under each natural region the first lesson can be usefully taught on a world map, showing the distribution of the particular region; and in the following one or two lessons the region chosen for special study should have its type characteristics brought out. Special care has been taken to see that the important countries of the modern world are included so that a proper world outlook may be obtained by the pupil. In studying about the advanced foreign countries, it is desirable to show the contrasts with the home land so that the pupils may be inspired with a feeling and knowledge as to the directions in which improvements are needed in the latter by the application of scientific knowledge and capital.

XX. *Lands of Indian Emigrants.*—For this topic the teacher may have to collect material from journals and newspapers also; and pupils may be given occasional readings from the newspaper.

XXI. *World Routes.*—Advertisements of shipping and railway companies and newspaper clippings for up-to-date information about airways may be found useful.

XXII. *India's World Trade.*—Statistical comparisons with diagrammatic representation would be found helpful for proper appreciation of India's position in this respect.

In conclusion, we wish to state again that the syllabus is a purposeful one, and can be expected to be of service to give a citizen's training both from the national and the international point of view. Possibly it may be considered ambitious and heavy. It need not be so, if time is not unduly wasted over certain items and the perspective of the syllabus is kept in view with proper allotment of time to the several topics. It should be remembered that many of the facts and principles are already known to the pupils, having been learnt in their study of Geography in the lower forms, and that they are brought together here for the sake of systematic treatment. It is hoped that teachers will give it a fair trial and not try to scrap it with a prejudice. In the light of experience, there is always time to make necessary changes and alterations. The facts that Geography is a B. Group subject should be taken advantage of not to neglect it. On the other hand, it should be welcomed as an opportunity for making experiments and striking out new paths, free from the trammels of an external examination, taking into account the teacher's special tastes and the peculiar advantages of each local environment. The Editor of the Journal will be glad to publish answers to queries regarding the right treatment of any particular topic in the syllabus.

Report of the Tiruvallur Regional Survey Committee

The Tiruvallur Regional Survey Committee appointed by the general body at the last annual meeting held on 27-4-1933 has the honour to submit the following report:—

Though the members of the committee met formally on 27-4-33 before the general body meeting and their appointment as a committee and discussed several important points regarding the regional survey of Tiruvallur, nothing appreciable could be done during the next two months as the members had broken up from Madras owing to the Summer Vacation.

After the reopening of the Colleges, the committee met for the first time on the 15th July 1933 when after a full discussion of the methods and ways and means regarding the survey in question, it was resolved (a) to stick to the Tiruvallur area for the first model survey (b) to recommend to the working council the employment of Mr. V. Krishnan, M.A., till September 1933 on a suitable salary and (c) to entrust him with the work of collecting as much preliminary information and materials as possible as well as to find out all the available sources of such informaion regarding the Tiruvallur area. Mr. V. Krishnan was accordingly appointed on a monthly salary of Rs. 50 with a monthly allowance of Rs. 25 towards travelling expenses; and the secretary was authorised to purchase maps, books and other materials required by Mr. Krishnan for carrying on his work.

The second meeting of the committee was held on 29-7-33 after Mr. Krishnan had been at work for a fortnight, and a discussion took place regarding the kind of data to be collected and the maps to be prepared; as a result of which instructions and guidance were given to Mr. Krishnan, who was also present at the meeting. The following were the maps that were considered necessary to be prepared in the first instance:—(1) Surface utilisation map, (ii) map of hydro-graphic conditions (Surface and underground): (iii) Relief map with contours and showing drainage on 8″ scale, and, (iv) soil survey map.

On 6-8-1933 all the members of the committee visited the village of Tannirkulam 3 miles east of Tiruvallur, to see and check

the work of Mr. Krishnan on the spot. They were received at the village by Dr. S. Dakshinamurthy, Secretary of the Tiruvallur Rural Reconstruction Committee and by Mr. J. F. Kendrick, Representative of the Rockfeller Foundation Trust, who explained the scope and programme that had been envisaged in their scheme.

On 10-8-33, the Committee met for the third time, when it was decided (1) that Mr. T. N. Muthuswamy should guide Mr. Krishnan in the matter of soil study, (2) that item 20 of village returns (concerning rainfall figures) should be checked and collected for as many villages as possible within the area, (3) that the one inch map should be enlarged to double the size, utilising the services of the draftsman and overseer of the T. R. R. Committee, and (5) that land utilisation maps should be prepared for the other type villages as for Tannirkulam.

The fourth meeting of the committee was held on 26-8-33, when Miss K. S. Ranga Rao was co-opted as a member of it. As regards the preparation of rainfall maps, it was decided that three seasonal and one annual maps should be prepared for the area; and as for the contour map, it was decided that a few spot heights of the one inch map should first be tested by the aneroid barometer, and then a few more heights determined to enable contours to be drawn at intervals of 25 feet.

On 10-9-33 Messrs. N. Subrahmanyam and T. N. Muthuswamy went to Tiruvallur with Mr. V. Krishnan and tested the chief spot heights along the Poonamallee—Tiruvallur—Red Hills Roads, and found that the method of fixing the spot heights with the help of the aneroid barometer was quite reliable and feasible.

On 1-11-33 a letter was received from Mr. George Kuriyan, stating that Mr. V. Krishnan, who had been working under the Committee, was awarded a University Research Studentship for working at the Regional Survey of Tiruvallur under his guidance. The work of the Committee *ipso facto* came to a close.

The Committee was consequently called to meet on 4-11-33 to review the work so far done and to decide its position. It was resolved to call upon Mr. Krishnan to submit all his work so far done with a Report thereon, and to circulate the same to the members of the Committee.

This Report was accordingly circulated to the members of the Committee along with the maps and statistics prepared and collected by Mr. Krishnan; and these will be preserved in the office for future reference and further work.

The total expenses incurred in connection with the work came to about Rs. 200, (including the cost of books and maps), the main item of expenditure being the stipend to Mr. Krishnan amounting to Rs. 187-8-0.

N. SUBRAHMANYAM.
Convenor.

To,
The Secretary,
Madras Geographical Association
Gopalapuram.

From,
V. Krishnan, M.A., Dip. Econ., Dip. Geo.,
Regional Survey, Tiruvellore.

Sir,

I have the honour to submit my report on the Regional Survey, I have been doing, in the Rural Development Scheme area in the Tiruvellore taluk, Chingleput District.

From the 16th of July 1933 till the 31st July I was mainly engaged, partly in Madras and partly in Tiruvellore, in the matter of looking up the various references and sources of information available, so that a definite line of action can be taken as regards the Survey.

In the second stage the village of Thannirkulam was taken and an intensive survey was made of that village and the maps given in the Appendix were prepared and submitted to the members of the Committee when they visited Thannirkulam about the middle of August.

In the light of the experience gained at Thannirkulam, I proceeded to collect the information available both in taluk office and by actual field work. The result of that is given in the appendix in the form of classified statements.

An intensive tour was undertaken by me from about the 20th of August till the 27th of September. About one-third of the area was covered during that period. The data collected during that time is also given in the Appendix. Various difficulties had to be encountered in the matter of the collection of data ; for the accounts as kept in the villages are not uniform, since in this tract Shotrium, Zamindari, Inam and Ryotwari villages are side by side. Some of the Zamindari and Shotrium villages have not been surveyed as yet and difficulty was found to locate various points for soil, crop and water table maps. They do not keep regular crop Registers and Rainfall accounts. Another difficulty was at the time of the visit in some of the villages when the authorities (Karnam and village munsiffs) were not available and so all the required materials could not be got at one visit. A third difficulty was that some of the accounts were sent to the Taluk Office and hence they were not available. So even in the data collected there may be some gaps which have to be filled in by further enquiry.

On the basis of such insufficient data I have not ventured to establish correlations between one factor and another and only give below the bare statistics in a tabulated form.

I have the honour to remain,
Sir,
Yours sincerely,
V. KRISHNAN.

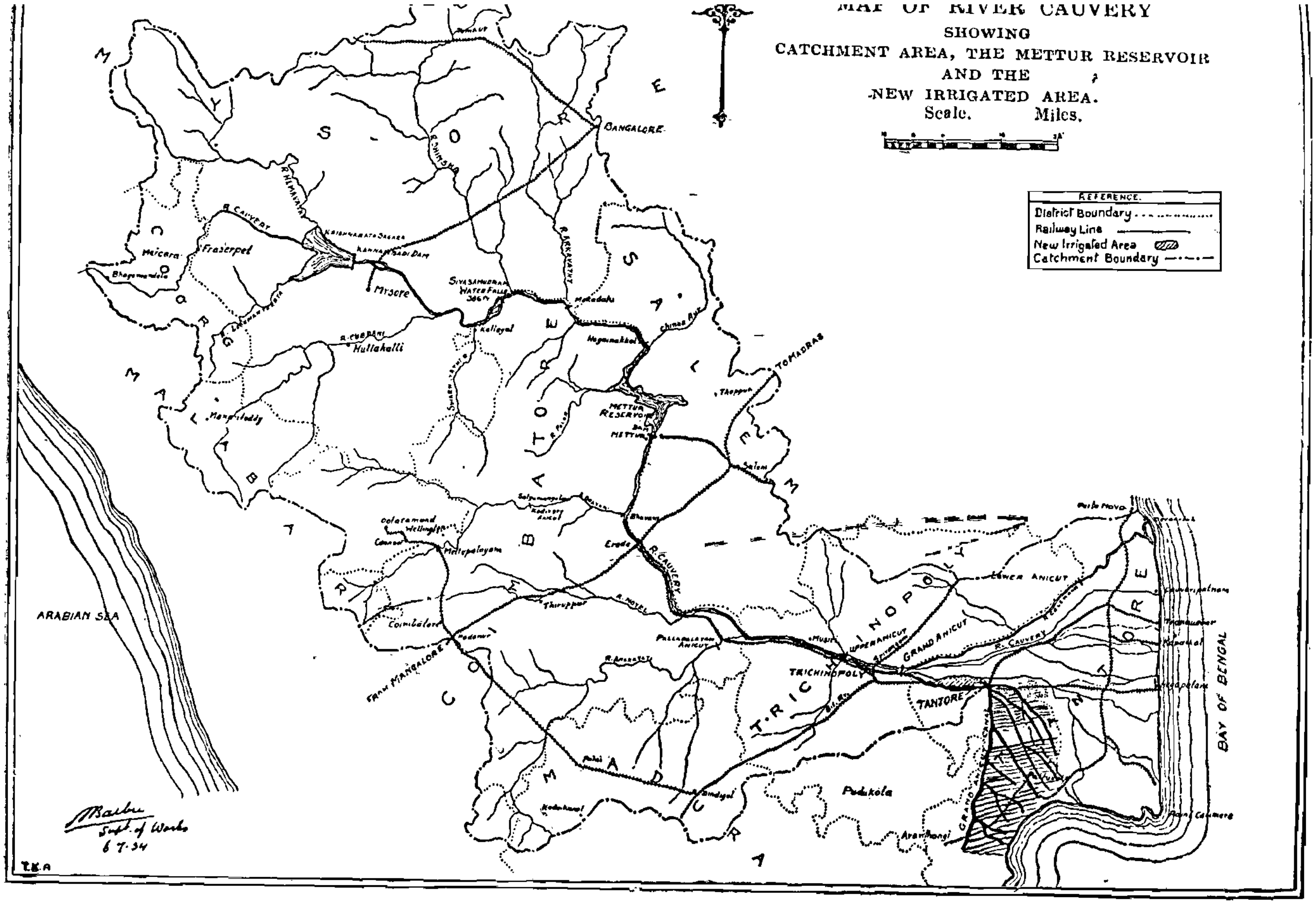
The Mettur Dam

EVOLUTION OF THE SCHEME

The river Cauvery rises in the Western Ghauts near Mercara in Coorg, at an elevation of 4,400 feet above sea level, and after a course of nearly 500 miles, enters the Bay of Bengal, draining an area of 31,000 square miles *en route*. The Western Ghauts are subject to heavy rainfall during the South-West monsoon and the highest run-off usually occurs in July or early in August. The Mysore plateau which drains into the middle reaches of the river is subject to fluctuating rains during the months of August to October. The important tributaries which join the Cauvery in this reach are the Hemavathi, the Lakshmanathirtha and the Kabini, which also take their rise in the Western Ghauts. After leaving the Mysore plateau, the Cauvery winds its way through hilly country and the Mettur Dam is constructed in a gorge where the river enters the plains. From this point downwards the catchment is subject to the North-East monsoon rains and the high floods due to this monsoon usually occur in November. The Bhavani, the Amaravathi and the Noyel are the chief tributaries joining the river in this reach though the first two in their upper reaches are under the influence of the South-West monsoon rains as well. This sequence of rainfall conduces to a fairly high flow during the irrigation season from June to January except for a short period of about six weeks when there is a break in the monsoon. While the South-West monsoon supply is copious and dependable, the North-East monsoon supply is irregular and frequently fails. The caprices of this monsoon have frequently affected, sometimes very seriously, the cultivation in the Cauvery Delta and the chief aim of the Cauvery-Mettur system is to remedy this state of affairs by storing the waters of the surplus floods in the South-West monsoon and distributing them evenly throughout the succeeding irrigation period.

THE CAUVERY DELTA

The head of the Cauvery delta is at the Upper Anicut, 10 miles west of Trichinopoly. Here the river bifurcates into two large branches, of which the northern takes the name of Coleroon and the southern retains that of Cauvery. A regulator spans the Coleroon at the Upper Anicut. The Coleroon is really the main channel of


MAP OF RIVER CAUVERY
SHOWING
CATCHMENT AREA, THE METTUR RESERVOIR
AND THE
NEW IRRIGATED AREA.
Scale. Miles.
REFERENCE.
District Boundary
Railway Line
New Irrigated Area
Catchment Boundary
MYSORE
COORG
MALABAR
COIMBATORE
SALEM
TRICHINOPOLY
MADURA
TANJORE
BANGALORE
Mysore
Fraserpet
Mercara
R. CAUVERY
R. HEMAVATHY
R. SHIMSHA
R. ARKAVATHY
Hullahalli
Sivasamudram Water Falls
Mekadatu
Hogenakkal
METTUR RESERVOIR
METTUR
Salem
TO MADRAS
Bhavani
Erode
R. CAUVERY
Ootacamund
Wellington
Coonoor
Mettupalayam
Coimbatore
Podanur
FROM MANGALORE
Thiruppur
R. NOYEL
R. AMARAVATI
TRICHINOPOLY
UPPER ANICUT
GRAND ANICUT
LOWER ANICUT
TANJORE
Pudukota
Dindigul
Palni
Kodaikanal
Arantangi
GRAND ANICUT CANAL
Porto Novo
Negapatam
Point Calimere
BAY OF BENGAL
ARABIAN SEA
Supt. of Works
6.7.34
T.K.A

the river and carries the bulk of the flood-waters to the sea. The Cauvery or southern branch is utilised as the main channel for the supply of irrigation water to the fields of the delta. The Cauvery and the Coleroon again nearly meet some 20 miles below, and the Grand Anicut, the key to the cultivation in the Cauvery delta, is built here on the left bank of the Cauvery. The scouring sluices at this anicut discharge the surplus waters of the Cauvery into the Coleroon. Just below this anicut the Cauvery bifurcates into two main (irrigation) rivers namely the Cauvery and the Vennar, at the heads of each of which a regulator has been built. The new canal excavated under the project, namely, the Grand Anicut Canal, also takes off from the same site. The Cauvery and the Vennar divide and subdivide into innumerable distributaries and together provide means of irrigation for about three-fourths of the area of the Tanjore district. The South-Western portion of the district is the new area served by the project, partly by the Grand Anicut Canal and partly by the extension of the already existing Vadavar system.

IRRIGATION IN THE CAUVERY DELTA

Irrigation in the Cauvery delta dates from time immemorial. Many old works still extant show that irrigation under some of the old Indian rulers received considerable attention. The system was, however, more an inundation system than a controlled irrigation system and must have on this score been defective from the very first. For a century before the advent of British Rule these works had been badly neglected on account of wars and political changes and in 1801, when the East India Company took over the Tanjore district, irrigation in the delta was rapidly deteriorating, the channels were silting up and fields were left uncultivated for want of proper water-supply.

To re-establish satisfactory irrigation conditions was one of the first problems for the British Government. Sand deposits formed the principal obstruction to the free flow of water and in the first few years their efforts were mainly directed towards their removal and the provision of scouring sluices. These efforts proved effective only as a temporary measure. The difficulty of water-supply was finally overcome only in 1836 when Sir Arthur Cotton built the Upper Anicut across the Coleroon to divert more water into the Cauvery. To make up for the consequent diminution in supply to the Lower Coleroon irrigation the Lower Anicut (70 miles below Grand Anicut) was also built across the Coleroon. But the supply

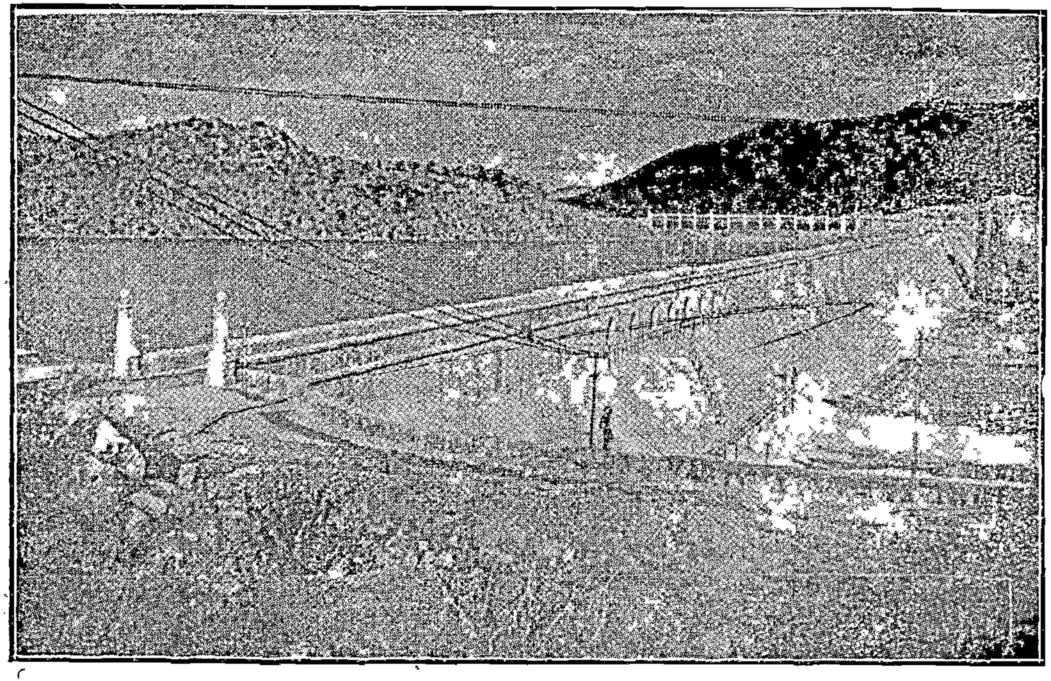


Fig. 2. The Mettur Dam.

in the Cauvery during floods now became too great to be controlled and began to cause serious damages to the bed and banks of the Cauvery. To check this tendency, a grade wall called the Cauvery Dam was built in 1845 across the Cauvery at the Upper Anicut. Further improvements followed, the most important of these being the construction of the regulator across the Cauvery and the Vennar at the Grand Anicut, the cutting down of the crests of the Upper and Lower Anicuts and the provision of lift shutters at these anicuts capable of holding up 2 feet extra supply for the benefit of irrigation, and the construction of regulators across the various rivers at the sites of all the important off-takes in the delta.

INCEPTION OF STORAGE AND ITS EVOLUTION

These improvements made the distribution of water-supply more systematic by placing under complete control whatever quantity of water was available at the Upper Anicut, but there still remained the defect of highly fluctuating supplies with long spells of drought, to be got over. A storage reservoir of a size that could help the delta to tide over the spells of drought by storing the surpluses when available was the obvious solution and the Mettur Dam is the result. " Storage " as a means of permanent improvement of irrigation supplies was conceived well over a century ago but the size of the reservoir, and its location were subjects of a long controversy which centred about the relative merits of a small reservoir on the Bhavani or a large one on the Cauvery. It was finally settled in favour of a large one on the Cauvery, and a carefully designed scheme, which has just been carried out to a finish with slight modifications, was submitted by Col. Ellis in 1910. The execution of this Project was held up on account of a long dispute with Mysore Government regarding the division of the surplus waters of the Cauvery. As soon as a workable agreement was arrived at with Mysore, the Project estimate was revised in 1924 and submitted to the Secretary of State shortly after, and the execution of the scheme was started on 20th July 1925, when the first blast was made in the presence of His Excellency the Right Hon'ble Viscount Goschen, then Governor of Madras. An Obelisk near the Right Flank of the Dam commemorates the inauguration of the present scheme.

PRESENT SCHEME

The Project, as designed, provides for a 60 square miles lake impounding 93,500 million cubic feet of water at Mettur,

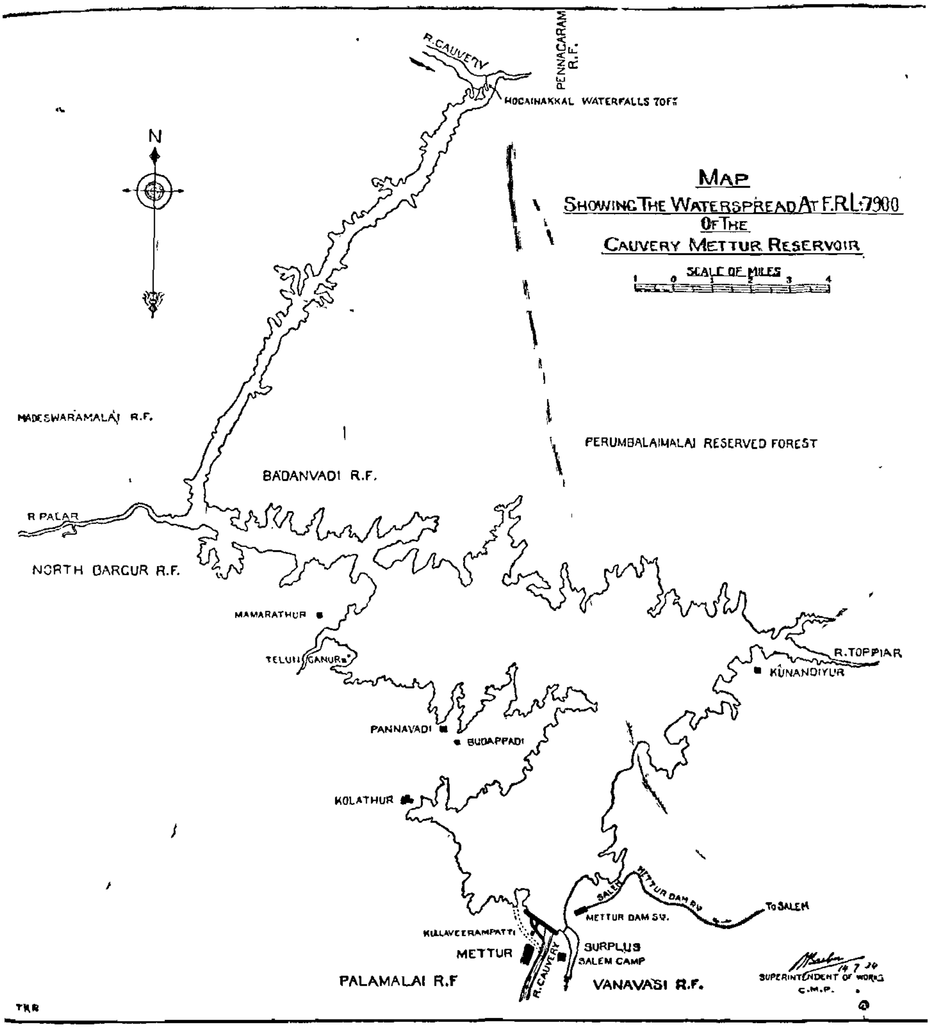

MAP
SHOWING THE WATERSPREAD AT F.R.L. 7900
OF THE
CAUVERY METTUR RESERVOIR
SCALE OF MILES
1 0 1 2 3 4
N
R. CAUVERY
PENNACARAM R.F.
HOGAINAKKAL WATERFALLS
MADESWARAMALAI R.F.
BADANVADI R.F.
PERUMBALAIMALAI RESERVED FOREST
R PALAR
NORTH BARGUR R.F.
MAMARATHUR
TELUII
GANUR
R. TOPPIAR
KUNANDIYUR
PANNAVADI
BUDAPPADI
KOLATHUR
SALEM METTUR DAM RY
TO SALEM
METTUR DAM STN.
KULLAVEERAMPATTI
METTUR
SURPLUS
SALEM CAMP
R. CAUVERY
PALAMALAI R.F
VANAVASI R.F.
14 7 34
SUPERINTENDENT OF WORKS
C.M.P.
TKR

Fig. 3.

The Dam is 5,300 feet long and contains 54.6 million cubic feet of masonry. The reservoir backs up 33 miles to the foot of the 70-feet high Hogankal Falls which become partly submerged. A new canal, the Grand Anicut Canal, with a capacity of 4,200 cusecs, has also been excavated to supply ultimately an extent of 271,000, acres of new irrigation and the improved and extended "Vadavar" will supply another 30,000 acres of new area. The second crop cultivation will also be increased by 175,000 acres, 70,000 acres in the old area and 105,000 acres in the new area. When the Project fully matures, the total cultivation in the delta will be 1,082,000 acres of single crop and 270,000 acres of double crop. The reservoir is expected to supply the requirements of this area of 1,352,000 acres.

Incidentally, the reservoir will also act as a flood moderator in times of extraordinarily heavy floods, and it has been calculated that had the dam been built prior to the super-flood of 1924, the disastrous effects of that flood would have been flattened out by about 15 per cent by the timely manipulation of the reservoir surplus works.

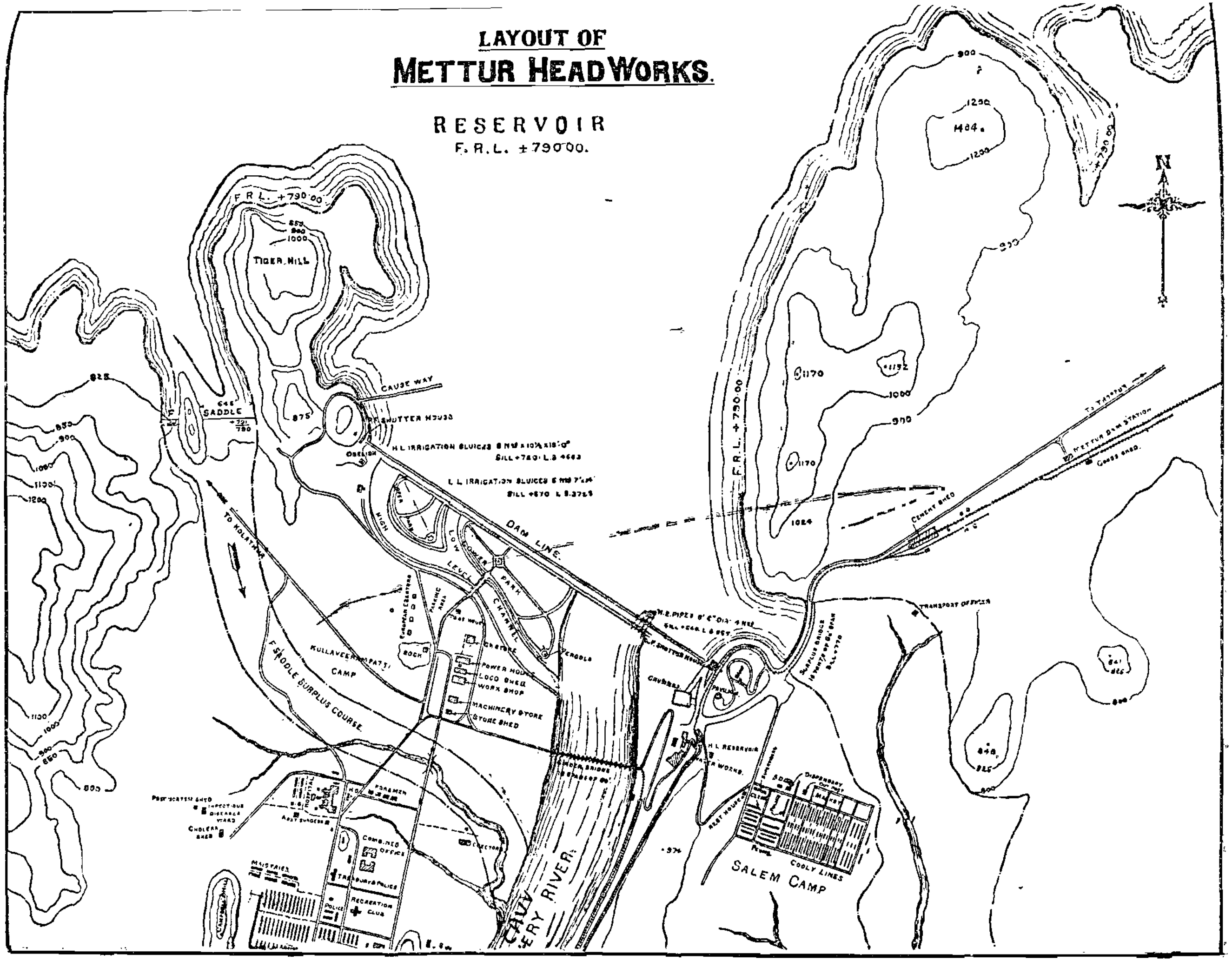
Like most modern works of this nature, the Mettur Dam is adaptable to the present policy of combining irrigation benefits with hydro-electric facilities, and a maximum of 49,000 h.p. could be obtained, the minimum depending on the conditions in each summer. Provision has therefore been made to facilitate the installation of 4 turbines operating under a maximum head of 150 feet, the requisite intake pipes etc., having already been fixed in the body of the Dam.

COST OF THE SCHEME

While the sanctioned estimate amounted to Rs. 737.08 lakhs, the actual cost of the entire irrigation scheme will be about Rs. 680 lakhs only, of which the cost of "Headworks" alone is 480 lakhs of rupees. A return of 6 per cent on the capital outlay is anticipated.

This Dam is believed to be the largest already constructed and the second largest including those under construction. The present design of the Dam also provides for its height being raised by 10 feet at some distant date to compensate for the silting up of the reservoir bed by providing for an extra capacity of 17,500 m. c. ft.

The main particulars of the dam are furnished below in the tabular statement:


LAYOUT OF
METTUR HEADWORKS.
RESERVOIR
F.R.L. ±790.00.
F.R.L. +790.00
TIGER HILL
CAUSE WAY
SADDLE
OBELISK
DAM LINE
LOW LEVEL CHANNEL
PARK
HIGH
TO KOLATHUR
F SADDLE SURPLUS COURSE
KULLAVEERAMPATTI CAMP
POWER HOUSE
LOCO SHED
WORK SHOP
MACHINERY STORE
STORE SHED
PERGOLA
H.L RESERVOIR
CAUVERY RIVER
SALEM CAMP
COOLY LINES
RECREATION CLUB
TREASURY & POLICE
COMBINED OFFICE
CEMENT SHED
TRANSPORT OFFICE
METTUR DAM STATION
N
Fig. 4.

PARTICULARS OF DAM

Catchment area	16,300 square miles
Width of river at Dam site	1,100 feet
Length of Dam	5,300 feet
Greatest height of Dam	214 feet
Width of Dam at top	20.5 feet
Width of roadway between parapets	16 feet
Top of Dam above mean-sea-level	+801.00 feet
Greatest bottom width at deepest portion of Dam	171 feet
Maximum depth of storage	165 feet
Maximum floods (1924)	456,000 cusecs.
Maximum discharging capacity of surplus works	550,000 cusecs.
Maximum waterspread	59.25 square miles
Maximum length of reservoir at maximum waterspread	33 miles
Full reservoir level above mean-sea level	+790.00
Maximum water level above mean-sea-level	+796.00
Capacity of reservoir:—Gross	95,660 m. c. ft.
Net (effective)	93,500 m. c. ft.

Regulation of water will be through the surplus sluices during most of the South-West monsoon season, i.e., from June to September, but when water falls below +774 level the High Level sluices will be opened for the supply of water to the delta. When water falls below +730, the regulation will be done through the Low Level sluices also. Normally it is not expected that the lake will fall below +735. But in a very bad year, which may occur once in ten years or so, it may go below + 730, when the Low Level sluices may have to be opened. The channel from the High Level sluices is designed to convey a supply of 25,000 cusecs but it can carry 30,000 cusecs in an emergency to dispose of extraordinarily high floods entering the lake.

EFFECT OF THE RESERVOIR ON CLIMATIC CONDITIONS

This reservoir with its extensive water-spread, is sure to have its effect on the surrounding country. It is too early yet to say de-

finitely what the effect would be. However, it is found even now that the maximum temperature during summer shows a tendency to decrease, while the humidity of the air is undoubtedly higher. The rock on which the dam is founded is so sound that there is no apparent rise in sub-soil water level in the valley below the Dam-site.

It is likely that the prevalence of malaria may increase owing to the presence of vast areas of shallow water at the margins, which have a total length of 180 miles. The presence, however, of swarms of larvicidal fish which already inhabit the shallow margins of the lake may effectively mitigate this danger.

THE CANAL SYSTEM

The Canal system is situated in the Tanjore District. The Main Canal takes off at the Grand Anicut just above the Cauvery-Vennar regulators at the right side. Work on the Canal system was started in 1926 and a good portion of the Canal has been thrown open for irrigation from the season of 1933. Owing to some controversy about the exact location of the area which should otherwise have come under the tail-end reach of the Grand Anicut Canal, there has been some delay in starting the work at the tail-end. It is expected that all the canal works will be completed in 1935.

DETAILS OF THE AREA TO BE IRRIGATED

Old Delta

	acres.
Single crop	886,000
Double crop—existing	95,000
Present single crop coming under double crop newly	70,000
Total ..	1,051,000

New Area

	acres.
Single crop	196,000
Double crop	105,000
Total ..	301,000

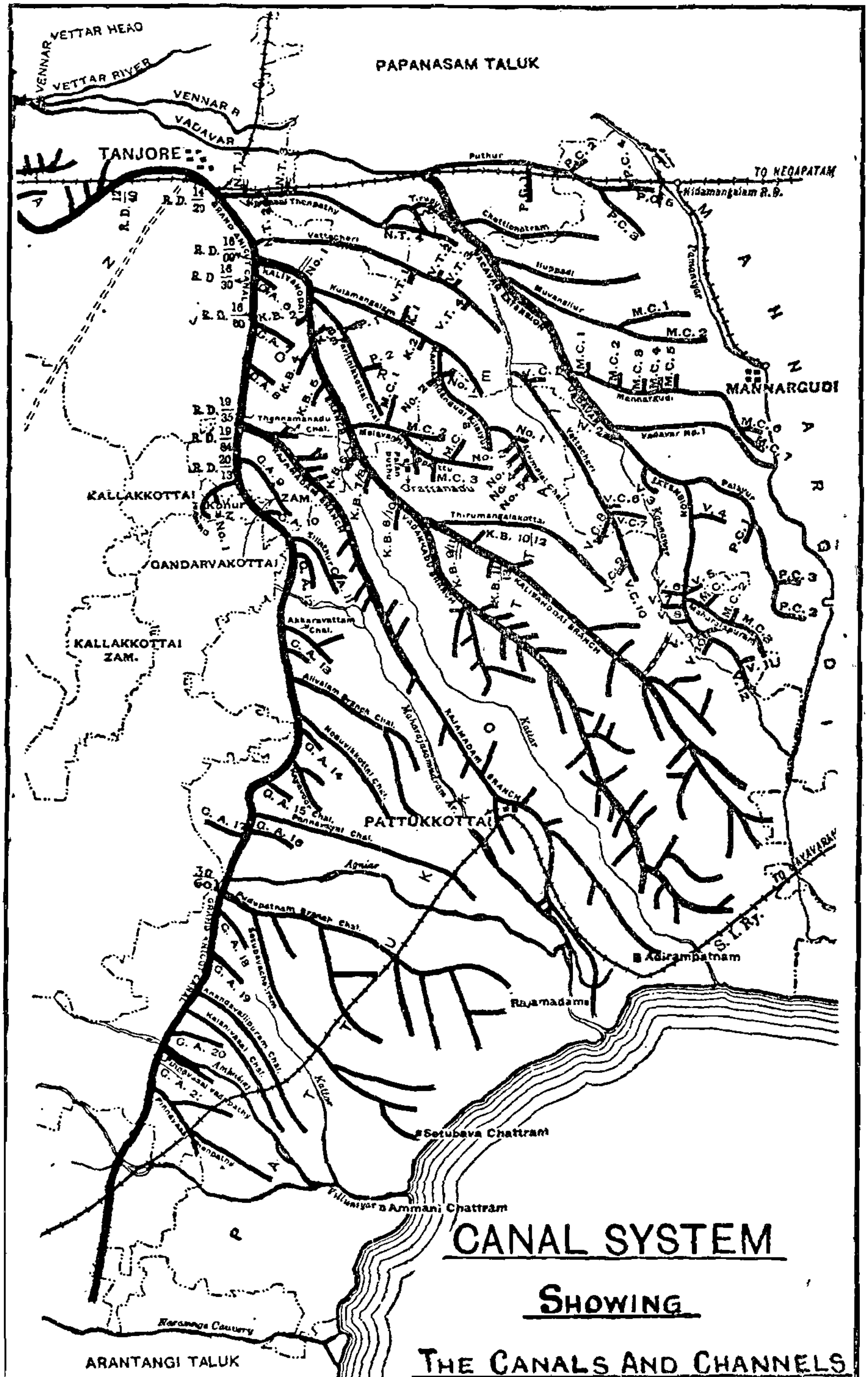

PAPANASAM TALUK
VETTAR HEAD
VETTAR RIVER
VENNAR R
VADAVAR
TANJORE
TO NEGAPATAM
MANNARGUDI
KALLAKKOTTAI
GANDARVAKOTTAI
KALLAKKOTTAI ZAM.
PATTUKKOTTAI
Adirampatnam
Rajamadam
Setubava Chattram
Ammani Chattram
ARANTANGI TALUK
TO AYAVARAM
S. I. Ry.
CANAL SYSTEM
SHOWING
THE CANALS AND CHANNELS

Fig. 5.

Other Details

	miles
Length of main canal	106
Length of branches and distributaries	694
Length of field channels	1,904
Total cost of canal system (estimated)	Rs. 200.0 lakhs.
Cost per acre of new irrigation	Rs. 66-7-0

The indirect benefits which must necessarily accrue from the development and improvement of irrigation in the Trichinopoly and Tanjore districts must inevitably lead to the greater prosperity of the people, better roads, more schools, greater industrial development and increased revenue to Government. The Project has been completed at a time of unprecedented depression in the prices of produce, and the development of irrigation may be somewhat slower than the forecast made when sending up the estimates for sanction. It is hoped, however, that brighter days are ahead and that prosperity will soon return with the rapid development of irrigation which this Great Project has been designed to effect.

HISTORY OF THE SCHEME

The Mettur Dam is believed to be the largest in existence, the net capacity of the storage being 93,000 million cubic feet as against the 43,934 million cubic feet capacity of the Krishnarajasagara and 37,600 million of the Assuan Dam in Egypt.

It was exactly one hundred years ago that Sir Arthur Cotton urged the desirability of constructing a dam across the Cauvery in order to regulate the supply of water to the Cauvery Delta, where the North East Monsoon, by its capricious character, failed to provide the extensive irrigated lands, with the necessary amount of water. As Mr. Stoney, the then Superintending Engineer, explained in his speech in July 1925, when Viscount Goschen laid the foundation stone of the Mettur Dam, the question whether the Dam ought to be constructed across the Cauvery or the Bhavani was canvassed for a series of years, and it was only in 1901 that the former was finally decided upon. Three years later, Mr. Moss prepared the estimates for the construction of a reservoir of 40,000 million cubic feet capacity, three miles from Neringipet, at a cost of Rs. 292 lakhs, for not only the Cauvery Delta, but also for irri-

gating a portion of the Salem and Coimbatore districts. Owing to the disproportionate cost with reference to the small area likely to be irrigated by including Salem and Coimbatore, this scheme was given up in favour of the one prepared in 1910, by Col. Ellis at an estimated cost of Rs. 385 lakhs. In the meanwhile, however, the Mysore and the Madras Governments were in correspondence regarding the sharing of the surplus waters of the Cauvery. The claim put forward by Mysore for raising the height of the Dam at Krishnarajasagara led to a big controversy and after a series of meetings, conferences and arbitrations, the question was finally decided at the time when Sir K. Srinivasa Iyengar was member of the Executive Council, making it possible for the Mettur Dam construction to be commenced.

THE COST

The cost of materials and labour had, in the meanwhile, gone up and fresh estimates for Rs. 612 lakhs were sent up to the Secretary of State in 1924 for sanction, which sanction was received in 1925. The administration Report for 1924-25 thus describes the works as then contemplated:

"The project, as a whole, has been constituted a circle of superintendence with a senior Superintending Engineer in charge for the present. The object of the scheme is to provide a reservoir which will, in the first place, regularise and safeguard the supply of water for an area of over a million acres of irrigated crop in the Cauvery delta (the supply is at present liable to extraordinary fluctuations and to failure at critical seasons) and, in the second place, enable irrigation to be extended to 300,000 acres of land now unirrigated. It involves the construction of a masonry dam (which will be larger than any dam now in existence and will form a reservoir with an effective capacity of 93,500 million cubic ft.) at Mettur above the junction of the Cauvery and Bhavani rivers, and a main irrigational canal about 88 miles in length, with a connected distributory system, having its off-take on the right bank of the Cauvery above the existing Grand Anicut. The new irrigation is expected to add 150,000 tons of rice to the food supply of the country. The estimated cost of the project as a whole is Rupees 612 lakhs and the net revenue with water-rates at Rs. 15 per acre for the first crop and Rs. 7-8 for the second is estimated to be rather over Rs. 46½ lakhs per annum, representing a return of nearly 7½ per cent on the sum at charge. The scheme will be financed

from loans. The programme contemplated in the estimate provides for the completion of all work in ten years and for the realisation of the full revenue by the twelfth year."

Subsequently, however, a new site had to be chosen one mile up-stream owing to the experience gathered from the unprecedented floods of 1924 and, soon after, Mettur was converted into a small town for the benefit of the contractors, coolies and officials engaged in the work, with complete sanitary improvements, lighting and other arrangements.

Visitors to Mettur would have seen the two big concreting towers which are over 300 feet in height. These were used for mixing, lifting and placing in position concrete, the dam having been constructed with cement obtained from Shahabad and concrete.

THE CANAL SYSTEM

A cardinal feature of the Mettur Project is the Canal system, the new Grand Anicut Canal taking off near the Cauvery-Vennar regulators, with branches and distributing channels costing over Rs. 200 lakhs. Since the first concrete foundation stones were laid in 1928, it has taken six years for the completion of the Mettur Dam and the final cost of the whole System is placed at Rs. 680 lakhs, as against the estimated cost of Rs. 737 lakhs. Owing to the economic depression and the unwillingness of ryots along the Canal System to take up water from the project, a good deal of delay has taken place in making the best use of the system; and the authorities are now placing the eventual return on capital at 6 per cent—an anticipation which remains to be proved.

The lake covers an area of 60 square miles and people living in the villages had to be compensated for. The Dam is exactly two feet over a mile. It is estimated that the project will ultimately irrigate nearly 300,000 acres, besides increasing the second crop cultivation to the extent of one half of that area, in addition to regulating the supply of water for the whole Cauvery delta.

Hydro-Electric installation, which is a part of the Project, has been constructed to develop a maximum capacity of 49,000 horse-power. Four sets of Hydro-Electric pipes have been built into the dam and with an average head of 125 feet, the horse-power developed will be 30,000 on the average. There will be four turbines of which one will act as a standby in cases of emergency.

SOME FACTS AND FIGURES

The following comparative figures will be read with much interest:—

206,000 tons of cement and 55,000,000 cubic feet of masonry have been used in the construction. The Dam is so high that the lake entirely fills the valley and when the river is in flood the excess water will spill over the end of the valley through a large surplus escape into the next valley and after cutting a fresh course for itself there, will join its old course 2 miles lower down.

The Dam is the largest single block of masonry in the world. The total length is 5,300 feet and average height 215 feet above the foundations and 176 feet above the river bed. The cubical contents exceed 54½ million cubic feet. It will irrigate about 1,300,000 acres of rice-fields 125 miles away from the Dam and with 70 miles of main canals and 600 miles of distributaries. The Dam is the cheapest per unit of water stored of any of the large Dams. It has also the largest water storage. The tabular statement of the world's largest reservoirs given below will be of interest for comparison.

Name of dam.	Cost.	Masonry contents.	Water Storage Capacity.	Period of construction.
	Lakhs.	million cubic ft.	million cubic ft.	years.
Assuan (Egypt) ..	367	18.8	37,600	4
New Croton (America) ..	212	23.1	5,120	14
Sennar (Africa) ..	847	14.8	22,560	7
Krishnarajasagara (Mysore-India) ..	250	29.9	43,934	16
Nizamsagar (Hyderabad-India) ..	366	30.1	25,446	—
Lloyd Dam (India) ..	172	21.3	24,198	6
Mettur Dam (South India) ..	478	54.6	93,500	6

Extracts from the Hindu.

THE PURPOSE OF THE SCHEME

Glaring Misconceptions Removed.

BY

DEWAN BAHADUR N. SWAMINATHA AIYAR,

Chief Engineer, (Retd.)

An article on the above subject might appear superfluous if not altogether unnecessary in view of the fact that the project has been talked about for years past and is taken to be so very widely known, especially in the Tanjore district. But when I was present at a recent conference of the Tanjore Landholders' Association, which was presided over by Diwan Bahadur M. Ramachandra Rao, several leading Mirasdars made all sorts of statements condemning entirely the Mettur Project, and one of them went to the length of stating that it has so far produced no good and that conditions have become very much worse than before. It was thus made clear that there is a lot of misconception about the project and this is the reason why I have been induced to write this article.

TO IRRIGATE AN AREA OF 301,000 ACRES

Having been connected with the P.W.D. for over thirty years and retired from service only recently, I believe my views are still viewed with a certain amount of suspicion as not appreciating correctly the difficulties of the ryots. I have therefore taken care to see that the facts of the case are stated correctly so as to remove misconceptions and left it to the readers to draw any inference they like. Briefly told, the project aims at stabilising the supplies to the existing delta and irrigating an area of 3,01,000 acres in the new area, commanded by the Grand Anicut Canal and the Vadavar Extension Canal, together with their distribution systems. Dealing first with the conditions in the Old Delta and how they have been affected by the Mettur Project, it would be as well to state that the reservoir provides for (1) An early supply to enable the cultivation of all lands in the delta, especially the double-cropped area. (2) A steady supply thereafter with reference to the requirements of irrigation for standing crops till they are harvested. (3) A mitigation of the floods to such extent as it is afforded by the moderating influence of the Reservoir at Mettur. Regarding item (1), the date of opening of reservoir is notified to be June 15th for double-cropped lands; and July 15th for single-cropped

lands; but these dates would be advanced up to the limit of 15 days *i.e.,* to June 1st and July 1st with reference to supply level in reservoir, taking care to see that there is no interruption in supply after the reservoir is opened for irrigation. Previously, there was no opening date and the supply in river depended on the breaking of the South-West Monsoon and the consequent rains in the catchment of river especially in the upper hilly portions. The supplies thereafter were irregular, if not uncertain, and there was no knowing as to what should be done as regards cultivation until the supply in the river improved and became fairly steady indicating that the monsoon is established. This uncertainty has been removed and a definite date will be available to start agricultural operations.

MIRASDARS' GRIEVANCES

The general complaint at the conference was, that the early supplies are confined to certain rivers and thus ignored altogether the need for early cultivation of lands grown with Ottadai. This is no doubt true to some extent as nothing will be gained by wasting the supplies in those rivers under which no double crop is grown and Ottadai crop was not treated as a double crop requiring early supplies. This does not, however, mean that the early supplies let down in the rivers are just sufficient to irrigate the present double crop area of 75,000 acres. They are much greater being nearly double or treble the quantity required and this extra supply is given firstly with a view to fill up all rivers, channels, and tanks so as to afford drinking supply to all villages and secondly to induce the growing of double crop over a greater area. This early supply is a great advantage for double-cropped lands in that it will enable the crop to be harvested before the North-East Monsoon breaks in and damages it as is often the case now. If Ottadai crop is also found to require early supplies there should be no great difficulty to arrange giving such supplies to them.

Supplies required for the single crop area are proposed to be given from July 15th so as to conform to the present practice and enable the harvesting of crops in February next year after the North-East Monsoon rains are over. If supplies are given very much earlier, the crop which will mature correspondingly earlier might get damaged by rains just before they are harvested. This aspect of the question will have to be carefully examined before any alteration is made in the date fixed for giving supplies to single crop lands.

DEFECTIVE DISTRIBUTION

Another grievance voiced forth by several Mirasdars is that the rivers did not run as full as in a normal flood. Apparently, they imagine that the rivers should run full to overflowing irrespective of the requirements of the irrigation. The quantity allowed to flow down the river is determined with reference to the requirements of the irrigation in the several periods of the irrigation season and aims at maintaining full supply levels in all the rivers taking care to see that there is no inequality in distribution at the several regulators. Under the conditions, prior to the advent of the Mettur Project, the rivers were no doubt occasionally in floods, especially during the months of July and August. A great portion of these floods discharged into the sea unutilised and it is only such wastages that are now impounded in reservoir so as to supplement any defect in river flow during the other months of the irrigation season. This steady supply is a great asset, the advantages of which cannot be exaggerated. This does not, however, mean that there will be no room for any complaint of defective supply in any portion of the delta. If such there be, they are due to *defective distribution* of available supplies, which requires to be investigated and remedied and not to *defective supply* as is very often imagined. A clear distinction should be made between defective distribution and defective supply and no inference adverse to the Project should be drawn in the case of the former. The investigation done in the Remodelling Division for over three years and the sanctioned works which have been or are being carried out, aim at correcting such defective distribution wherever it was known to exist. To give only one instance, the open dam at head of Araslar was discharging 50 per cent more than what it ought to carry for the ayacut under it. There were no means of regulating the supply and on occasions when there was excess flow down it, with a corresponding shortage in the other branch, *i.e.*, Cauvery, there was no remedy. With the conversion of the dam into Regulators, which has been completed this year, means have been provided for correcting the inequality in distribution and as a result thereof, the difficulty experienced hitherto will not recur. Other such instances wherever known to exist, have been and are being remedied and if more instances come to notice, they will have to be investigated and remedied in due course.

ERRONEOUS IMPRESSIONS

There is an impression that the authorities are mindful only about the supply to the new canals and channels without caring as to what happens to the existing deltas. This is quite erroneous. The supply levels in the old delta are maintained as usual and then only supply is led down into the new canals. There is absolutely no necessity to cut short the supply to the Old Delta for the sake of the new area. At any rate, such a contingency will not arise now, the area irrigated in the new portion being only about a tenth of the area for which irrigation has been provided for. The supply led down the new canals and branches remain for the most part unutilised. This is why they appear full; but the quantity of water consumed is small being proportionate to the area brought under cultivation.

The absence of any supply in the rivers of the Old Delta during this year's closure was complained of bitterly and was attributed to the Mettur Project. It is clear that this is far from truth. Owing to special works in progress at the Grand Anicut and Cauvery and Vennar Regulators, the hot weather flow was diverted into Coleroon keeping Cauvery and Vennar completely closed. This is a special feature of this year which will not ordinarily occur. At any rate, the Mettur Project has nothing to do with it.

Another subject which was persistently talked about is the question of silt entrapped in the Reservoir. It cannot be denied that a portion of the silt brought down by the river Cauvery at Mettur is entrapped therein; but when the discharge required for irrigation or the floods are passed down through the supply or overflow sluices as the case may be, most of the silt, especially of the lighter type passes down and it is only the heavier sandy silt which will settle down in the Resesvoir. Again the silt brought down by Bhavani, Amaravathi and Noyyal which is considerable passes down into the delta as hithertofore. The grievance is therefore true only to a very small extent and is very much exaggerated even long before they have been able to realise what it will be in practice.

There is again a strong feeling against the localisation of double crop lands. This proposal has been started mainly with the idea of ascertaining how the area is distributed at present and what steps should be taken towards increasing that area so as to form compact blocks which would result in economy of supply and

efficiency in distribution. Already the double-cropped area is confined mostly to Tanjore, Papanasam, Kumbakonam and portions of Mayavaram and Mannargudi Taluks. A line drawn right across the delta from north to south along the eastern boundary of Kumbakonam Taluk will form roughly the demarcating limit. It will therefore be a business proposition to confine the supply to this portion, taking care however to see that all rivers, channels and tanks are given the first flushing to provide drinking water-supply to all villages and to enable seedlings to be grown for such stray areas, as have been cultivated hitherto with double crop. The question will require to be thoroughly examined after proposals are framed by Government and it is therefore premature to condemn the proposal outright at this stage.

POTENTIALITIES OF THE METTUR AREA

POSSIBILITIES FOR NEW INDUSTRIES

The industrial possibilities and potentialities of the Mettur Project are referred to at some length in an illustrated pamphlet prepared by Mr. L. B. Green, M.B.E., Deputy Director of Industries. It is an interesting document well worth a perusal by the public interested in industrial development.

The headworks area of the Project includes Mettur township on the right bank of the river Cauvery, in the Mettur taluk of the Salem District, with an extension on the left bank. The two parts are connected by a girder bridge of sixteen spans across the Cauvery, carrying two lines of tram rail and a road. The site is connected with Salem Junction on the main line of the South Indian Railway (broad gauge) by a branch line 26 miles long, and with Erode, another junction on the main line, by a motor road 35 miles long. This branch line, we are told, forms part of a projected railway from Trichinopoly via Namakkal-Salem-Dharmapuri-Hosur to Bangalore. Mr. Green says when this through communication is established, it will tap the Bangalore area and be the shortest route for bringing cotton, etc., from Bellary to Mettur. The township, as will be seen from a perusal of this pamphlet, possesses the most up-to-date amenities; it is carefully laid out, and traversed by metalled roads, and will shortly be connected by a metalled road with the Madras—Calicut trunk road,

The object of the publication is to invite the attention of manufacturers in India and abroad to the facilities which will be afforded by Mettur, on the completion of the Project in 1934, as a suitable location for the establishment of manufacturing industries and the setting up of mills and factories of various kinds.

The pamphlet then describes in brief the works proper, the history of their inception, the geographical situation of the Mettur Settlement and facilities for communication by rail and road, the existing buildings and other amenities, climatic conditions, possibilities of securing cheap labour, water-supply, and cost of electric power. We take the following paragraphs from the pamphlet :—

TEXTILE PRODUCTS

Cottage Industries

One of the main difficulties which has tended to restrict the development of industries in South India has been the high price and scarcity of fuel, but the position in this respect will be altered greatly for the better in the areas affected when electric power is available from the Mettur and Pykara projects. When cheap electricity becomes available, it should be possible to greatly develop, in what are to-day purely rural areas, small scale industries for working up into manufactured or semi-manufactured form the agricultural products of the province and thus to improve the economic condition of the villages with a consequent increase in the amenities of life on the countryside. Electricity, where available at a reasonable price, will provide greatly improved facilities for the development of rural tracts. Electric power can be used for such varied purposes as pumping, sawing, fodder cutting and grinding, rice hulling, groundnut decorticating, oil milling, cotton ginning, bone-crushing, sugarcane crushing and sugar manufacture.

The development of textile industries in the home will also be fostered by a cheap electric supply and the following home industries of this character may be mentioned :—

(1) Single power loom for cotton weaving.

(2) Single power loom for silk weaving.

(3) Single power knitting machine for making socks.

(4) Single power circular knitting machine for making banians with artificial silk.

(5) Single power Barfus loom for mesh banians,

(6) Power warp preparation factory for supply of warp to knitting machines.

(7) Power warp preparation for supply of warp to cottage cotton power looms.

(8) Power warp preparation for supply of warp to cottage silk power looms.

(9) Dyeing and stencil printing.

Again, the facilities that will be afforded in the Mettur area, when the project is completed and cheap electricity is available, would appear to offer scope for the setting up of small textile factories of the following descriptions:—

(1) Cotton power looms of 20 looms unit.

(2) Silk power looms of 20 looms unit.

(3) Small factory for the preparation of tapes, ribbons, shoe-laces, saree borders and similar articles.

(4) Warp preparation factory for supply of warp to small scale cotton factories.

(5) Silk throwing plant for supply of yarn to small scale silk factories.

(6) Wool spinning plant.

(7) Knitting factories for socks, banians, fish nets, and mosquito curtain cloths.

(8) Dyeing factory.

(9) Central carding factory for distributing silvers to cotton spinners.

(10) Factory for the manufacture of knitting healds.

(11) Factory for the manufacture of reeds.

(12) Factory for the manufacture of appliances such as jacquards, dobbies and slays, jacquard cards, shuttles, pirns, bobbins, etc.

TEXTILE MILLS.—COTTON SPINNING AND WEAVING MILLS

In view of the fact that a considerable proportion of the raw-cotton produced in the Madras Presidency is exported, there is considerable scope for the establishment of additional power spinning and weaving mills. In the Madras Presidency, the cultivation

of cotton is largely carried on in the districts of Tinnevelly, Ramnad, Madura, Coimbatore, Trichinopoly, Salem, Cuddapah, Anantapur, Bellary, Nellore, Kurnool, Guntur, Kistna, Godavari, and Vizagapatam. Mettur is situated in the Salem district and is bordered by the Coimbatore district. The trade names of the several varieties of cotton grown in the Madras Presidency are 'Cambodias', 'Tinnevellies,' 'Salems,' 'Northerns and Westerns', and 'Cocanadas.' 'Cambodias' are grown in the districts of Trichinopoly and portions of Coimbatore and Madura district, 'Tinnevellies' in the districts of Tinnevelly, Ramnad, and portions of Madura; 'Salems', (Uppam) in the Salem district and portions of Coimbatore district 'Northerns and Westerns' in the districts of Kistna and Guntur, Cuddapah and Chittoor and 'Cocanada' in the districts of Bellary, Kurnool, Anantapur, Cuddapah and Chittoor and 'Cocanadas' in the district of Kistna and Guntur. Of the Southern India cottons, 'Tinnevellies' are well suited for the production of 40s. counts and below, whilst others are suitable for 24s. counts and below. The Northern staple is ⅞ inches, the Eastern ¾ inches, the Cocanada ⅝ inches to ⅞ inches, the Karunganni ⅞ inches the Tinnevelly ¾ inches to ⅞ inches, and the Salem ¾ inches.

The acreages under each variety and the production in bales are shown in the following table: —

1930-31

Trade name.	Area in acres.	Yield in bales of 400 lbs. each.
Cambodias	243,600	87,690
Tinevellies	524,800	128,550
Salems (Uppam)	159,400	33,810
Nadam and Bourbon	41,300	1,790
Northerns and Westerns	920,950	101,460
Cocanadas	163,500	25,290
Others	17,800	2,300

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There are about 2,500,000 acres of land normally under cotton cultivation in the Madras Presidency, and the normal annual yield is about 500,000 bales of 400 lbs. each.

SCOPE FOR MORE MILLS

The average annual imports of Madras during the last few years have been 7 million lb. of yarn and 70 million yards of cotton piecegoods, and there can be no question that having regard to the quantity of cotton available in the Province and the market for yarn and piece-goods in it, there is considerable scope for the setting up of additional spinning and weaving mills. There are at present only six or seven weaving mills in the Presidency employing a total of nearly 5,000 looms. The number of spinning mills is 22 and new mills are under construction or projected. The spinning mills employ at present over seven and a half lakhs of spindles.

It will now be convenient to consider under various heads whether the conditions precedent to the establishment and profitable operation of cotton mills exist in the Mettur area. The essential conditions which a site for a cotton mill should satisfy are—

(a) Proximity to cotton-producing tracts.
(b) Availability of power at a reasonable rate.
(c) Transport facilities.
(d) Ample supply of labour.
(e) Sufficient water.
(f) Sufficient humid climate.
(g) Proximity to markets for the disposal of products.
(h) Suitable areas of land for the erection of factory buildings.

(a) Proximity to cotton-producing tracts.—Mettur is in the Salem district. As already stated, cotton suitable for 24s. and below is grown in the district of Salem and in the adjacent district of Coimbatore, while Mettur is in railway communication with other important cotton growing districts, such as Trichinopoly, Madura, Ramnad and Tinnevelly as well as with other districts further afield.

(b) Availability of power at a reasonable rate.—It has been shown that the cost of power at Mettur will probably range from 4 to 6 annas per unit and that an ample supply of water will be available for all purposes.

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(c) Transport facilities.—These, which have been described in the Introduction, page 6, as well as on page 13, appear to be favourable.

(d) Ample supply of labour.—There will be a large organized labour force in existence at Mettur on the completion of the project which, after training, would no doubt be suitable for employment in mills and factories. The nucleus of the trained labour for textile mills could be drawn from Coimbatore and other cotton mill centres.

(e) Sufficient water.—Water for industrial purposes could be obtained in almost any quantity from the river Cauvery. It cannot definitely be stated at what price such water will be available, but it could probably be supplied at about Rs. 3 per 1,000 cubic yards, a proportionate rebate being allowed for water returned to the river properly purified to the satisfaction of the health authorities.

(f) The climatic conditions of Mettur have been fully discussed and in Appendix B will be found an extract from the weather reports of the rainfall and evaporation station at Mettur. If necessary, mechanical humidifiers could be installed, although as pointed out elsewhere, the waterspread which will be formed on the completion of the project will almost certainly render the climate more humid and thus more suitable for textile factories.

(g) The distances from Mettur to Salem, Erode, Coimbatore and Madras are 26, 35, 81 and 233 miles respectively. The cloth produced by weaving mills in Mettur should be able to find a sale in *Madras and other important consuming centres. If cheap yarn* is produced by spinning mills set up at Mettur, it should be readily absorbed by the handloom weavers in the various districts of the Presidency with which Mettur is in road and rail communication.

(h) On the Salem side of the river suitable factory sites are available near the railway station and could be purchased from Government or from private owners.

The chief items in the manufacturing costs of a cotton mill excluding raw materials, are labour and power. It is generally recognized that in order to obtain the best results and maximum production from spinning and weaving machinery, it is necessary to apply an even turning moment at the driving shaft of the machine free from cyclical irregularities and to maintain a close speed regu-

lation. In a mill supplied with power produced by a reciprocating engine, cyclical irregularities in the speed of productive machinery must occur. A rapid increase in the use of electric power in the textile industries is taking place in all countries and the majority of the machinery now turned out is made for motor drive. With electric drive increased productive efficiency as also a better product—whether it be yarn or cloth—could be obtained. Mettur would therefore appear to offer special facilities for the setting up of cotton mills by reason of its cheap power and other advantages.

DYEING FACTORIES

Dyeing factory.—If spinning mills are set up in the Mettur area for the production of yarn, and weaving mills for the production of cloth, there should be scope for the establishment of bleaching, dyeing and finishing plants as adjuncts to such mills. The essential requisites for a dyeing factory are—

(a) Cheap power.
(b) Adequate supply of suitable water,
(c) Skilled labour, and
(d) Availability of yarn and cloth for dyeing.

Factors (a) and (b) will be present at Mettur, the permanent hardness being only two parts per 100,000. The requisite skilled labour could be attracted to the spot while, if spinning and weaving mills are set up, supplies of yarn and cloth for dyeing will be available.

It is estimated that a small factory at Mettur turning out 12,500 lb. of dyed yarn per month should be able to produce dyed yarn at 8 annas per lb. There would seem to be scope for a small dyeing and aerograph printing concern.

CHANCE FOR SILK FACTORIES

Silk industry.—The manufacture of silk goods is by no means an unimportant section of the handloom weaving industry, while silk enters into combination with cotton in a number of varieties of cloth. India produces from one and a half to two million pounds of raw silk annually and also imports from China and other countries about an equal quantity. The magnitude of the industry may be gauged from the fact that in the Kollegal taluk of the Coimbatore district 25 lakhs of rupees' worth of raw silk is manufactured

annually. In addition to this quantity, about a crore of rupees' worth of raw silk is imported into the Madras Presidency from other parts of India and from foreign countries and the whole of this quantity in addition to the silk produced in Kollegal is used by the weavers. Raw silk is at the very outset a fine yarn, but it requires doubling and twisting so as to produce a thread sufficiently thick to stand the strain involved in the process of weaving. If therefore twisted silk is produced at Mettur with the aid of the facilities available there, it should find a ready sale amongst the handloom weavers of the Presidency. In fact, the establishment of silk throwing factories is essential for the development of power loom silk weaving on a small or large scale in this Presidency.

HOSIERY MANUFACTURE

Hosiery industry.—If spinning and dyeing concerns are started in the area, Mettur with its cheap electric power would seem to afford scope for the establishment of well-conducted power-driven hosiery factories, as the necessary supplies of yarn could be obtained from the spinning and dyeing mills. The market for hosiery goods in India is a growing one, only the fringe of the potential demand having yet been touched. India is Japan's principal customer, importing knitted goods from that country to the extent of over 3,300,000 dozen in 1929.

IRON ORES OF SALEM

The iron ores of Salem, admitted to be of a very high grade quality and the magnesite ore, said to be the finest in the world, open up possibilities of a profitable investment to enterprising capitalists with the facilities now afforded by the Mettur Project. The pamphlet of the Deputy Director of Industries discusses this question at some length.

The development of electric power on a large scale at Mettur and the consequent availability of a cheap supply a few years hence opens up the question of the exploitation of the Salem iron ores with power derived from the Mettur Project. The history of the attempts to manufacture iron by European processes in the Madras Presidency dates back to the early part of the last century. The presence of rich iron ores in the southern taluks of the Salem district and the existence of an ancient indigenous iron smelting indus-

try in numerous centres of this area, an industry which though working with exceedingly crude appliances produced excellent wrought iron and steel, attracted attention so far back as 1818 when Mr. J. M. Heath of the Madras Civil Service conceived the idea that a profitable business could be established by the application of modern methods and machinery to the industry. After resigning the service, he obtained in 1830 from the East India Company, exclusive rights for carrying on operations throughout the Madras Presidency. Blast furnaces were erected at Porto Novo on the East Coast and though it was proved that excellent pig iron could be made from the Salem ores, commercial success was not achieved. A new Company styled the 'Porto Novo Steel and Iron Company' took over the furnaces and enlarged them, built others at Beypore on the West Coast and carried them on till 1849 but still unsuccessfully. Another Company styled 'The East India Iron Company' acquired the concern in 1853 and built furnaces at Tiruvannamalai and another at Pullampatti on the banks of the Cauvery in the Salem district. They made roads from Pullampatti to Kanjamalai which contains the most celebrated of the magnetic iron beds, carried the ore to the works on the river and smelted it there with charcoal brought by boats from Sholapadi, 18 miles up the Cauvery. The Company commanded large capital and established foundries, puddling forges, rolling mills and even Bessemer steel converters. It was not commercially successful and the operations came to an end in 1867. Yet another attempt was made in 1875 by the Napier Foundry Company of Madras to establish an iron industry on a large scale, but with its failure in 1877 ended the last attempt to manufacture iron by European processes in the Madras Presidency. In 1895, the question of working the Salem iron ores again received attention. The construction of the railways which connected the Salem district with the East and West Coast and with the Singareni coal fields, the cheapening of ocean transit and the improvements by inventors generally in iron and steel making plant and in furnaces effecting considerable reduction in the cost of production introduced new factors in the situation. The Secretary of State submitted the question for the consideration of Mr. Jeremiah Head, a past President of the Institute of Mechanical Engineers, who went into the whole question very carefully. Mr. Head's conclusions which were arrived at after a study of the whole question were briefly: (1) that an export trade in Salem magnetite to European ports must 'for the present' be given up as impracticable as it could not be delivered at prices prevalent there except at a loss; (2) that charcoal

pig iron could not be produced in the Salem district at a cost which would enable it to compete either there or at Madras with imported pig iron and (3) that the substitution of Singareni coal would not improve the chances of success. The question was revived in 1914 by Messrs. E. Gaudart and Company of Pondicherry. They obtained a mining lease for over 4,369 acres in the Kanjamalai reserve forest for the purpose of working the iron ore. They extracted a small quantity of the ore and sent ten tons to France for a magnetic concentration test. The report was favourable, but the War prevented the working of the concession, and the lease was cancelled towards the end of 1916.

HIGH QUALITY OF THE ORE

The electric iron smelting industry is well established in Sweden, such electric furnaces having been set up to replace the small charcoal blast furnaces in which high grade Swedish iron was formerly made. The substitution of the electric furnace in place of the charcoal blast furnace in Sweden was due to the necessity of cheapening the cost of production of pig iron since the cost of making the iron using cheap Swedish water power is less than in the blast furnaces. Swedish experience goes to show how vital the question of the quality of the ore becomes when it is dealt with in furnaces of small dimensions and yield. So far as the Salem ore is concerned, it has enjoyed a traditional reputation for high quality and has been held to be equal to the Scandinavian ore. The statements in the District Gazetteer that it is possible to obtain in Salem an almost inexhaustible supply of ores with an average of nearly 60 per cent of iron and that the ore contains no phosphorus or sulphur (which detract from its value for purposes where a high grade iron is required) represent the strength and vitality of this tradition. In 1914, when Messrs. Gaudart and Company of Pondicherry submitted the question of the quality of the ore to the Geological Survey, the opinion was expressed that the ore with an iron percentage of 50 to 60 occurred only in 'small pockets' or as veins, and referring to a previous analysis of a specimen which showed a percentage of 39.02 of iron, it was thought that this represented the real crude ore of Kanjamalai, which anyone working the deposits on a large scale would have to deal with. Subsequently, in order to settle the question of the quality of the ore, a number of samples of iron ore from the Salem district which previously had been collected by Sir Thomas Holland were analysed by the Geological Survey of India. Of the six analyses that were made, two showed iron percentages between 67 and 69 while in the other four the iron was

as low as 30 to 40. In 1925 three tons of Kanjamalai ore was, at the instance of M. Gaudart, subjected to extensive concentration trials by Messrs. Fried Krupp, and the results, which were distinctly promising, went to show that the ore could be improved by magnetic concentration as readily as similar Swedish and Norwegian ores. A sample of the powdered and concentrated ore was therefore submitted to the Geological Survey of India for opinion and when assayed gave 66·9% of metallic iron. The Director of Geological Survey reported that the material was highly magnetic and evidently consisted of magnetite and that there was a concentration of 92.4 per cent Fe_3O_4. It was pointed out by the Director that any ore containing over 60 per cent of iron may be looked upon as first-grade ore, and that there is no question therefore of the grade of the Kanjamalai concentrates. The conclusion that emerges from study of the documents bearing on the question of the development of the Salem iron ores is that the obstacle in the way of the success of these ventures was the difficulty of obtaining a continuous and sufficient supply of cheap fuel. In Mr. Head's report it is stated that the lack of cheap fuel is the main difficulty, while M. Gaudart has expressed a similar opinion. The availability of cheap power from Mettur which is only about 40 miles from Kanjamalai would therefore appear to justify a re-examination of the question and it would probably be well worth while for a prospective manufacturer to verify the existing data by arranging for a magnetic test to be carried out on a bulk sample of the ore.

SALEM MAGNESITE

There are very extensive deposits of some of the finest magnesite in the world in the Salem district, but although this mineral is usually considered to be of considerable value, the deposits do not appear to be worked to an extent at all comparable with their magnitude. This is due to a variety of causes, the chief of which appears to be the restricted demand both in the country itself and for export purposes. Though almost unlimited quantities of crude magnesite are available, it has not been possible so far to increase the demand for the material. The increase in the United States import duty on calcined magnesite in 1927 from 14 to 21 dollars per ton has had an adverse effect on the Salem magnesite industry, there having been a reduction in the tonnage exported to that country, while the profit on the reduced shipments is said also to have declined. Unless therefore new outlets can be found for the mineral, the outlook for the industry in the Salem district does not ap-

pear to be particularly promising, although the demand in the country itself for magnesite in the form of floorings is expanding to a limited extent. Salem calcined magnesite is considered to be about the best in the world for magnesite composite floorings and other similar uses in the building industry. Deadburnt magnesite, as used in steel furnaces and the manufacture of bricks therefore is in large demand, and there would seem to be possibilities in regard to the manufacture of this form of magnesite at Salem although a difficulty is that Salem magnesite is very pure and contains very little iron. Cupels for gold and silver assays are also manufactured in the Salem district from the material.

A possible use of magnesite is in the production of magnesium sulphate or epsom salt by treating the magnesite with sulphuric acid. Although magnesite is so cheap, the price of sulphuric acid is high and it is probable that a factory established at Mettur on a large scale could operate with a margin of profit only if a good price could be realised for the carbon dioxide recovered in the process.

A new process is believed to have been evolved recently for the manufacture of magnesium metal from magnesite, and to this is due the increased demand for crude magnesite. Magnesium metal is lighter than aluminium and the demand for it is expected to be great. If the commercial possibilities of magnesium metal are established, it would seem well worth while for manufacturers to consider the setting up of a factory in the Salem district for the manufacture of the new metal with the aid of the cheap electric power available from the Mettur Hydro-Electric Project. It is understood that a market is already developing in fused pure magnesite, and it should be practicable to fuse such magnesite with cheap electrical power at Salem as is done in Switzerland.

MANUFACTURE OF CHEMICALS

SCOPE FOR FERTILISERS

The prospects of Madras becoming a centre for the manufacture of chemicals are surveyed by Mr. Green in his pamphlet on the industrial possibilities of the Mettur area.

The suitability of Madras as a centre for the manufacture of certain basic chemicals has been investigated from time to time, but

the conclusion arrived at was that the prospect of the development of a heavy chemical industry in Madras was remote owing to the high cost of fuel. In any attempts to foster the development of chemical industries in India, attention should be directed in the first instance to such industries as can utilize Indian raw materials now exported to foreign countries where they are worked up into various finished products. Under this category may be included the raw materials from which vegetable oils, artificial fats and feeding cakes are manufactured. The fact that during the next few years cheap electric power will be available in the Mettur area seems to justify a re-examination of the possibilities of establishing certain chemical industries in this Presidency. Second only to sulphuric acid in importance for the development of chemical industries are the alkalies (sodium carbonate and sodium hydroxide), since little expansion of other industries can take place unless these chemicals are available at a low price. The question whether there is scope for the development of the alkali industry at Mettur would seem to merit examination. The bulk of the caustic soda now manufactured in America and Europe is produced electrolytically from aqueous solutions of common salt. The power for generating electricity is usually and most cheaply provided by water power and so the Niagara Falls in America and the waterfalls in Norway and other countries rich in water power are the main seats of this industry.

THE ALKALI INDUSTRY

Electrolysis of salt solution.—The products obtained from the electrolysis of an aqueous solution of common salt are caustic soda solution, chlorine and hyrogen.

Caustic soda.—The caustic soda solution can be evaporated and caustic soda prepared. It finds a use in many industries including soap, textiles (mercerising of cotton), paper, dyeing and purification of petroleum and mineral oils. The caustic soda could also be converted into sodium carbonate or sodium bi-carbonate. The imports of sodium bi-carbonate into India are about 110,000 cwt.

Chlorine.—The annual yield of chlorine from the electrolysis of common salt solution would be about 400,000 cwt. Chlorine is not imported into India to any appreciable extent. It can, however, be used for preparing bleaching powder, the other chemical required being lime which is available in the vicinity of Mettur. Bleaching powder is used for bleaching textiles and paper pulp; whilst large

quantities are also required for the sterilization of water and for the preparation of hospital disinfectants.

Hydrogen.—The annual production of hydrogen would be about 120,000 cwt. and a portion of this quantity could be used for the hydrogenation of oils. The balance of the hydrogen could be converted into hydrochloric acid.

Fixation of nitrogen.—In this process the nitrogen of the atmosphere is made to combine with elements under definite conditions of temperature and pressure resulting in the production of compounds such as cyanamide, ammonia and nitric acid.

PULP AND PAPER PRODUCTION

POSSIBILITIES IN METTUR AREA

That the facilities for securing the essentials of production like continuous and cheap supply of raw materials, motive power and water supply have now become adequate to establish pulp and paper manufacturing industries in the Mettur area is the view held by Mr. Green, in his interesting survey of the possibilities of opening up the Mettur area.

Mettur would appear to offer considerable scope for the establishment of a pulp or paper industry. In view of the heavy capital requirements of the industry, the first essential is a continuous and assured supply of the raw material. Investigations recently undertaken by the Forest Department indicate that a secure supply of bamboos existed and that the fundamental problem of getting the supply to a mill at Mettur would not present insuperable difficulty. The raw material occurs within forty miles of Mettur and bamboos in exploitable quantities are found over an aggregate of 35,000 acres in the reserves of Ramapuram Forest range, whilst an additional area of 5,000 acres carries bamboos in the unreserves. If a reasonable reduction is made in the gross bamboo area, it may safely be estimated that 25,000 acres contain dense bamboos. The Ramapuram bamboos are not, however, the only possible source of raw material for a pulp or paper mill at Mettur. There are extensive bamboo areas in Bargur range which are within easy access of the Palar and the Cauvery, and bamboos from this range could be float-

ed down to Mettur. On the Palamalai hill, which adjoins Mettur, 3,000 acres contain bamboos. The average lead from this area to Mettur is under ten miles. There are in addition vast bamboo tracts in Bargur and Bhavani ranges, the outturn from which could be carted down to Mettur. It is probable that similar bamboo areas exist on the Salem side of the Cauvery. According to Mr. Raitt, the authority on the utilisation of bamboo for pulp and paper manufacture, a plant producing 10,000 tons of pulp is the smallest that would be economically feasible. Thus a sustained annual supply of 22,500 tons of air dry bamboos is the minimum required to run a pulp mill at a profit. If, however, a paper mill instead of a pulp mill were established at Mettur, a smaller unit producing about 5,000 tons of paper would be an economic proposition and in this case the minimum raw material required would be only 11,660 tons. The Forest Department estimates that from the Ramapuram range alone, an annual outturn of 28,000 tons of air dry bamboo could be obtained which in itself should be sufficient to support a 10,000 ton pulp plant. It will be evident, therefore, that a pulp or paper mill at Mettur would be extremely unlikely to fail for want of raw material.

TRANSPORT CONDITIONS

Transport conditions.—The bamboo tracts in Ramapuram range are disposed round a central point called Uthupium within a radius of six miles. This point lies at an elevation of 1,500 feet and would form a convenient base for the bamboo exploitation operations as the river Cauvery flows within ten miles of Uthupium. The road which would have to be constructed in order to transport bamboos to the river would pass through easy country and the cost of construction is not likely to exceed Rs. 2,500. An alternative course would be to construct a tramway between Uthupium and the rafting station. From the rafting station the bamboos would be rafted down the Cauvery to the mill at Mettur over a distance of a little more than twenty miles. It is possible that artificial propulsion of the rafts might be necessary on account of the absence of a current strong enough to move the rafts quickly above the dam. The scheme of extraction would therefore be as folows: Bamboos would be cut by coolies and dragged or carried by them to the collection depot at Uthupium. From Uthupium they would be transported in carts or trains running on a tramway down to the Cauvery, whence they would be rafted to Mettur.

Cost of extraction of bamboos.—The cost of a ton of air dry bamboo at works is estimated as follows:—

Item.	Rs.	A	P.
1. Cost of felling 450 bamboos and transporting to collection depot for an average distance of 4 miles.	6	0	0
2. Cost of transport of carts for a distance of 10 miles from collection depot to rafting station (one cart will carry a ton) ..	2	8	0
3. Transport by rafts to works a distance of a little over 20 miles say ..	2	0	0
4. Contingencies ..	0	4	0
..	10	12	0

Thus the total cost of one ton of air dry bamboo at works amounts to Rs. 10-12-0. Allowing a margin of 25 per cent, the equivalent of a ton of paper pulp will cost about Rs. 30-4-0. To this must be added the royalty payable to Government, say Re. 1 per ton of bamboo. Government would probably be willing to lease the bamboo area for a term of say 20 years.

Labour.—Labour is available in the local villages, though it is not perhaps likely to be sufficient for the bamboo extraction operations and it may be necessary to import additional labour. There should be no serious difficulty in regard to this, however, as the completion of the Mettur Project will throw large numbers of men out of employment and they will be available for the mill as well as for the collection of raw material. Coolies can always be obtained from the Salem side of the Cauvery.

Index Figure of Prime Costs.—As a ready means of ascertaining whether a project is a sound financial proposition or not, Mr. Raitt, the authority previously quoted, has prepared the following index figure consolidating the various items of cost for preparing a ton of pulp:—

	Rs.	A.	P.
1. Two and a half tons of bamboo at Rs. 15 per ton ..	37	8	0
2. Four tons of fuel at Rs. 6 per ton ..	24	0	0
3. Three-fourth ton of limestone at Rs. 8 per ton ..	6	0	0
4. One ton pulp freight to port ..	12	8	0

A mill at Mettur would have an advantage in respect of the price of the bamboo, whilst under fuel there should also be a saving as compared with Mr. Raitt's figures provided the electricity which will be available at Mettur is used for steam raising in the digesters as well as for power. Burnt limestone can be delivered at Mettur for about Rs. 28 per 100 cubic feet. The freight on a ton of pulp from Mettur to Madras would be Rs. 16-7-0.

SPECIAL ADVANTAGES

Advantages afforded by Mettur for the pulp or paper industry. —The general factors favourable to the location of a pulp or paper mill at Mettur may be briefly summarized as follows :—

(i) The species of bamboo occurring in the area is almost exclusively *Dendrocalamus strictus* which is specially suitable as a raw material for pulp manufacture. The Forest Research Institute has demonstrated the suitability of bamboos generally as raw material for paper pulp and in particular of *Dendrocalamus strictus*, the local species of bamboos which is usually not subject to gregarious flowering.

(ii) From the Ramapuram Forest range alone it is estimated that at least 25,000 tons of dry bamboo annually could be extracted and delivered at mill site at Mettur for less than Rs. 15 a ton. An adequate and sustained supply of raw material at reasonable rates should therefore be assured.

(iii) River transport would be available for the greater part of the total lead right up to the mill.

(iv) As the proposed mill would be situated on the banks of the Cauvery, an inexhaustible supply of fresh water, an essential requirement of a paper or pulp mill, would be available.

(v) Cheap electric power is available. The cost of power at Mettur would range from 0.4 to 0.6 anna per K. W. H. whilst special rates will be allowed for industrial establishments guaranteeing an annual consumption of not less than 400,000 units.

(vi) Large quantities of limestone of the crystalline variety are available near (1) Mavelipalayam near Sankeri, 53 miles from Mettur ; (2) Pakkanad, a village in Salem district, 15 miles from Mettur by road ; and (3) Anandampalayam, a village 15 miles from Mettur on the road to Bhavani.

(vii) As explained elsewhere, suitable plots of land for the erection of the main mill buildings are available at Mettur, whilst a large number of buildings suitable both for factory and residential accommodation will be available when the Mettur Project is completed.

(ix) Tram lines, haulage engines and other industrial plant could probably be purchased cheaply from the Public Works Department on completion of the dam.

CHANCES FOR PAPER MILLS

Relative advantage of pulp and paper manufacture.—Whether it would be possible to supply the existing manufacturing concerns in India with pulp from Mettur, or whether it would be practicable to export pulp to Japan and Australia in replacement of the considerable quantities which those countries import in normal times from Scandinavia is a matter for expert investigation. Similarly the question of the relative advantages of manufacturing pulp or paper at Mettur is one for decision by experts. The bulk of the trade is conducted in unbleached pulp, but in view of the fact that cheap power will be avilable at Mettur, it might be more advantageous to manufacture the bleached product. Should an alkali industry be started and bleaching powder produced at Mettur a bleached pulp or paper mill would of course be in a particularly advantageous position. Imported bleaching powder could, however, be delivered at Mettur at about Rs. 182 per ton. One of the advantages of manufacturing paper in preference to pulp is that the overhead and depreciation charges to be carried per ton of product can more easily be carried on the higher value of paper than on the lower value of pulp, and further it is perhaps easier to sell paper than pulp. If a paper mill were set up at Mettur, it should be possible to turn out (i) cream laid and other writing paper, (ii) white printings other than newsprint, (iii) wrapping and packing paper, (iv) badami paper, and (v) brown paper of a satisfactory standard of quality. The imports of these and other varieties of paper (excluding newsprint) into the Madras Presidency by sea during the last three years appear to have averaged about 7,200 tons. The market for paper in this Presidency is not at present large, but though the average consumption of paper per head of the population is very low, there can be little doubt that the consumption will develop gradually in response to the growth of education.

The prospects of a pulp or paper mill at Mettur, utilizing mainly the bamboos of Ramapuram range in Kollegal Forest division as raw material, would seem to be reasonably promising. There is, as already shown, ample bamboo within economic reach of Mettur, whilst many other essential conditions appear to be favourable.

EXPLOITATION OF OIL SEEDS RESOURCES

The exploitation of the vast oil seed resources of the Presidency, held up so far by the lack of proper facilities for production and marketing, has now been rendered a commercial proposition through the facilities in the Mettur area and due largely to the demand for vegetable oil and fats for industries like soap, artificial ghee, lubricants, etc. Mr. Green, in his pamphlet on industrial possibilities in the Mettur area, details the prospects of starting hydrogenation factories which might eventually supply not only all our needs but also secure a good export trade in those commodities.

Oil seeds are of great economic importance to the Madras Presidency owing to the variety of the seeds and the extent of their production. Only a very small percentage, however, of the annual outturn of oil seeds is converted into oil, the greater portion being exported as such to foreign countries. In the year 1929-30 the value of exports of seeds amounted to Rs. 1,412.30 lakhs or 33 per cent of the value of the total foreign export trade of the Presidency in Indian produce and manufactures. The value of foreign exports of groundnuts during 1929-30 amounted to Rs. 1,338.97 lakhs representing 30 per cent of the foreign export trade.

The exploitation of the vast seed resources of the Presidency must depend to a great extent on general industrial development and the setting up of factories utilizing vegetable oils as a raw material. Soap factories are a case in point, as every additional soap factory that is established increases the demand for groundnut and cocoanut oil. A still more important potential outlet for vegetable oil lies in the manufacture in India of vegetable ghee on a large scale. If the manufacture of pure artificial ghee from vegetable oil is developed in India, it would result in the utilization in the country itself of an increasing quantity of the oil seeds

produced in the Presidency and the lowering to the public of the price of ghee and other fats. An increased quantity of oilcake would also become available to the ryots at a cheaper price for use as manure and the soil would consequently be enriched. Mettur would appear to be a suitable location for the establishment of a factory for the manufacture of vegetable fats by the hydrogenation process, as the main road to Madras from Calicut will pass through it, while it is in railway communication with Salem. In virtue of its proximity to such centres as Erode, Coimbatore, Pollachi and Palghat on the West Coast, a factory at Mettur would be able to secure almost all kinds of vegetable oils and fish oil in any quantity. If an export trade is developed, shipments can be made through the ports of Madras, Calicut and Cochin. An ample supply of water is assured while electricity will be available at a very favourable rate.

HYDROGENATION FACTORY

In view of the suitability of Mettur for the establishment of a hydrogenation factory, it may be worth while to discuss the possibilities of such manufacture. The hydrogenation industry is strongly established in Europe and America and hardened fats prepared from vegetable oils and fish oils, have, owing to their cheapness, now almost entirely replaced the use of mutton and beef tallow in soap factories in Europe. In America, there is a considerable production of hardened fats. In India there should be undoubted scope for the employment of the hydrogenation process, for, not only are the requisite natural oils available, but there is a good market for the products. The use of beef fat is objected to by Hindus and pig fat (lard) by Muhammadans. There should therefore be a steady and growing demand for hardened fats both for use in the manufacture of toilet soaps and as a suitable substitute for ghee. At present Indian soap manufacturers have to depend largely upon tallow (beef and mutton) in the manufacture of high class toilet soaps. Local tallow is of very indifferent quality and is extremely wasteful to refine, while the quality available is neither steady nor sufficient. On the other hand, tallow imported from Australia, New Zealand and England is very expensive. Soap manufacturers in India, who have to use at present an expensive tallow for high class soap are therefore placed at a disadvantage in competing with soapmakers in Europe. An assured and cheap supply of a suitable tallow substitute prepared from vegetable oils in this country would give a decided impetus to the development of the toilet soap industry.

HARDENED FATS

Among the other uses of hardened fats, the following are the most important:—

(1) Artificial ghee, ghee substitutes, margarine.
(2) Lubricants.
(3) Candles.
(4) Insulating compositions.
(5) In the tanning of leather.

(1) At present pure ghee is not available in India in sufficient quantities and the price also is very high, while most of the bazaar ghee is unwholesome and grossly adulterated often with deleterious substances. As a result, ghee substitutes manufactured in Europe are finding an increasing market in India. Although such products are not equal to pure ghee in the matter of flavour, taste, and nutritive value, they are harmless and are infinitely superior to the so-called ghee vended in the bazaars. The artificial ghee factories in Europe and America are now said to be adding something in the nature of a substance rich in vitamin to hardened fats in order to make up for the deficiency of this vital element which is necessary, though in a minute quantity for nutrition. These ghee substitutes are simply hardened vegetable fats or mixtures of such hardened fats and liquid vegetable oils such as cocoanut oil, sesame oil or groundnut oil blended with a small admixture of butter, fat or even ghee. In Europe hardened fats are now even replacing tallow and lard as shortening material in the manufacture of bread.

(2) Formerly tallow was commonly used in the manufacture of lubricants; but now hardened fish oil is gradually taking the place of tallow owing to its cheapness. An outlet for hardened fats should be found in the form of axle grease on railways as also in mills and factories which use tallow for the lubrication of machinery.

(3) Hardened fats are used in Europe in the manufacture of candles. Stearic acid obtained by the ordinary process of fat splitting and distillation is more expensive than hardened fats, as the process of preparing stearic acid is very elaborate and the output limited. For use in tropical countries, candles made from hardened fats are preferable to those made from mineral wax of a low melting point, as the latter, though cheap, are wasteful.

(4) As insulating composition, hardened fats are extensively used in Europe.

(5) In the tanning industry, stearic acid produced by the hydrogenation is used in place of olea-stearine. For stuffing harness leather, hardened fat is gradually taking the place of tallow.

It will be seen from the foregoing that hardened fats are used for a variety of purposes and that there should be a growing demand for such fats in India. India is importing annualy about 23,000 tons of vegetable fats, chiefly, from the Netherlands, most of which is consumed as edible fats or substitutes for ghee.

On the basis of the figures embodied in the foregoing statement, the cost per cwt. of hardened fat works out on an average to Rs. 388-4-0.

A GROWING MARKET

There already exists a good market in India for hardened fats, and the demand is likely steadily to increase. The possibility of developing an export trade in hardened fats should not be overlooked as such products in the form of solid slabs could be easily packed and shipped. The difficulty attending packing, liability of oil to become rancid, losses due to leakage, higher freight rates and other causes which now operate as an impediment to the successful development of the export of oil from India are factors which are absent in the case of shipment of hardened fats. The large quantity of oil consumed by the hydrogenation industry would give an impetus to the oil milling industry in the Presidency and to the cultivation of oil seeds which is passing through a difficult time. An hydrogenation factory at Mettur could either set up its own oil crushing mill or draw its supplies from oil mills in the surrounding country.

Report of the Eighth Annual Meeting of the Madras Geographical Association

The Eighth Annual Meeting of the Madras Geographical Association was held at 4-30 P.M., on Saturday, the 21st July at the University Department of Geography, Wesley College, Royapettah, with M.R.Ry. Rao Bahadur Krishna Rao Bhonsle Avl., in the chair.

The Report of the Association for the year 1933-34 was read and adopted, after which the Election of Office-bearers for 1934-35 took place. The following persons were elected for the Working Council for 1934-35:—*President*: Miss J. M. Gerrard, M.A.; *Vice-Presidents*: Miss E. D. Birdseye, B.Sc., and Mr. Rao Bahadur R. Krishna Rao Bhonsle, B.A., I.S.O.; *Secretary*: Mr. N. Subrahmanyam, M.A., L.T., F.R.G.S.; *Treasurer*: Mr. G. Narayanaswami, M.A., L.T.; *Other Members*: Miss K. S. Ranga Rao, B.A. Honours (London), F.R.G.S.; Mr. George Kuriyan, B.A., B.L., B.Sc. (London); Mr. T. L. Krishnamurthy Ayyar, M.A,; and Mr. B.M. Tirunarayanan, B.A., (Hons.)

The Report of the Tiruvallore Regional Survey Committee of the Association was then read, discussed and recorded.

A Standing Committee of Experts, consisting of the following members (with power to co-opt) was next appointed to answer references and advice educational authorities on technical matters such as text-books, syllabuses, schemes of study, etc.:—Miss J. M. Gerrard, Miss H. T. Scudder, Mr. N. Subrahmanyam, Mr. George Kuriyan, Miss K. S. Ranga Rao, Miss E. D. Birdseye, Mr. S. Muthukrishna Ayyar, Mr. G. Narayanaswami, and Mrs. P. S. Sundara Raj.

In bringing the proceedings to a close, the new President, Miss J. M. Gerrard paid a tribute to the steady and energetic work of the Secretary Mr. N. Subrahmanyam, but for whom, she said, the Association would not have come into existence or continued so long. She then appealed to the members to strengthen the finances of the Association by enlisting more members, making a practical suggestion that each member should try to get in one more member.

After the meeting terminated with a vote of thanks to the chair, the following Geographical Films were then put on the screen:—

(1) Sculpture of the Land by rivers and the Cycle of Erosion; (2) The Work of Underground Waters; (3) The Arid South-West; (4) Forest People of Central Africa; and (5) The Little Swiss wood-carver.

News and Notes

The Eighth Annual Meeting of the Association could not be held in April last ; and was postponed to July. An account of the meeting is published in this number. From the Annual Report, it will be found that membership went down considerbly (to about 300) in the past year. But as a result of the enthusiasm evinced by the members at the Meeting, membership has since been going up rapidly.

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The Tiruvallore Regional Survey, which was taken up as a fresh activity of the Association during the past year, had to be given up in the middle, as Mr. Krishnan who was doing the work under the guidance of a committee of the Association was awarded a University Research Studentship for continuing the work under the auspices of the University. A Report of the Regional Survey Committee along with Mr. Krishnan's Report of his work is printed in this issue.

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In the Annual Meeting a standing committee of experts consisting of teachers of Geography, in high schools, training schools and colleges, has been appointed in order to answer references and advise educational authorities on technical matters. The personnel of the committee will be found in the report of the meeting.

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It is gratifying to note that the call for reform in the teaching of Geography in the elementary schools has come from the teachers thmselves. We already referred to the Refresher Course in Bhavani. After the reopening of the schools in July, the Secretary was invited to address the elementary teachers at Vellore and at Ambur on Geography teaching in Elementary Schools. He also spoke to the teachers of the A. R. C. Higher Elementary School on the same subject.

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It is also pleasing to note that school excursions are getting to be more common in schools of all grades, and their advantages coming to be more generally appreciated. The Secretary is usually requested to organise and conduct or sometimes to give information and advice. One of these excursions was a hill climb on Kailasagiri, 2,880 feet above sea-level, 5 miles from Vellore. This was joined by several elementary and high school teachers of Vellore.

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We are sorry to note that Miss K. S. Ranga Rao, who has taken a high qualification in Geography, was transferred to do History work in the Queen Mary's College, and that she has since severed her connection with the college. What is a loss to Madras is a gain to Nagpur, where she is now lecturer in the Arts College for Women.

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The reaction of the new S. S. L. C. Scheme, where Geography stands to suffer in importance as we pointed out in the previous number of the Journal, has already been felt in several ways. For one thing the strength of the Diploma Class in Geography has fallen from 25 last year to 15 in the present year, and that of the Geography Section of the L. T. Class in the Teachers' College from over 40 in the last two or three years to 29 in the present year. This is clearly symptomatic of the ebb of the tide, which has reached its lowest level, we hope.

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The new syllabuses in Geography for B and C Groups are now ready ; and they have been included in this number. A useful commentary by Mr. N. Subrahmanyam has been appended. Teachers of Geography, who handle the syllabus, are invited to refer their doubts and difficulties to the Editor of the Journal, who will arrange to get them answered by experts.

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As in last year, an excursion has been organised for the Michaelmas holidays for a period of not more than 10 days. The places proposed to be visited are Kolar Gold Fields, Bangalore, Sivasamudram, Seringapatam, Mysore, Kannambadi, Pykara, Ooty, Coimbatore, Mettur, and Yercaud. The expenses are expected not to exceed Rs. 40.

Reviews

The Southern Continents. By Thomas Pickles. Book I—South and Central America. Book II—Africa. Book III—Australia, New Zealand and the Pacific Islands. Price 1sh./9d. each (J. M. Dent & Sons, Ltd., London).

The three books of the series are intended for Secondary School pupils who are taking a course preliminary to School Certificate or Matriculation. A comparative study of the climates of the Southern Continents introduces each of the three volumes, affording a conspectus and basis. After this, general physical geography of each of the continents is treated as preparatory to detailed regional study. In books I and III one chapter is devoted to Discovery and Exploration of South America and Australia respectively. The regional studies are presented in an interesting way with proper correlation of the physical and the human elements. A few suggestive exercises are given at the end of each chapter; and each volume is illustrated copiously with sketches, diagrams, maps and pictures. The get-up is neat and attractive.

Black's Geography Pictures: Set 6—*Asia.* Selected and edited by J. Fairgrieve. Price 1sh./6d. (A. & C. Black, Ltd., London).

This packet is the 6th of a series of 8 sets of geography pictures, selected and edited by the veteran teacher of Geography and its pedagogy, J. Fairgrieve, and published by the well-known publishers of finely illustrated series like Peeps at Many Lands. Their Travel Pictures are already in wide use; and this is a new venture on similar lines.

The set includes 64 pictures, which have been very carefully selected as representations of types, the chief aim in their choice being " to present only *pictures which make plain things to which there is continual reference in Geography lessons* and about which there is danger of misconception." Being printed on one side of the paper, they can be distributed to pupils for individual or class work and can be projected by means of the epidiascope.

The pictures are classified in four groups : types of relief, types of vegetation, types of human activity and types of human settlement. The bulk of them are in the third group ; and Indian pictures are over a third. A carefully prepared letter-press under each picture draws attention to the salient geographical features, which go to make it a type. The set is cheap for the value ; and we would strongly recommend their general use in schools.

Outlines of the Geography of the World. By Mr. G. Srinivasa Aiyar. Part I—The Southern Continents and North America. Price 12 as. (Srinivasa Varadachari & Co., Madras).

This book has been prepared in accordance with the Madras S.S.L.C. (A. Group) Syllabus, which has just been scrapped along with the scheme of which it was a part. It covers the portion that can be covered in Form IV. The treatment is clear and simple and makes a direct appeal to the pupils' imagination. The volume is copiously illustrated with sketch-maps, diagrams, and a wealth of representative pictures ; and each chapter closes with a few important questions and exercises.

A Middle School Geography (in three parts) in Malayalam. By Mr. E. J. Edona. Price 8 as. for Part I, and 10 as. each for Parts 2 & 3. (The Kerala Publishing Company, Calicut).

The general complaint with regard to the teaching of Geography in South Indian schools has been that the reformed methods have not yet filtered down to the middle school classes ; and that the text-book writers have not given any lead in this direction. Mr. Edona has done service to Geography teaching in Malayalam schools by attempting to remove this defect. He has planned and prepared this series of books on right lines by reducing the amount of mere geographical facts, introducing plenty of practical work at each stage and in each lesson and by emphasising only certain aspects of world geography in each year instead of making an exhaustive survey of a particular continent every year as has been the vogue hitherto. The book has been illustrated with innumerable sketch-maps, diagrams and tabular statements of statistics as well as pictures. As this is one of the very few books in vernacular written on right lines, we have no hesitation in recommending it for use in Kerala schools.

Books and Journals Received

Outlines of the Geography of the World (Part I). By Mr. G. Srinivsa Ayyar.

A Middle School Geography (Three parts) in Malayalam. By Mr. E. J. Edona.

Black's Geography Pictures—Set 6 : *Asia.*

The Southern Continents: 1. South and Central America. 2. Africa. 3. Australia and New Zealand. By Thomas Pickles.

Proceedings of the Royal Geographical Society of Australia for 1932-33, Volume XXXIV.

Exhaustive Questions on the Southern Continents. By S. Joseph.

The Indian Review—May, June and July 1934.

The Educational Review—May, June and July 1934.

The South Indian Teacher—May, June and July 1934.

The Geographical Journal—May, June and July 1934.

The Gardening Review—May, June and July 1934.

Kalaimagal—May, June and July 1934.

Mitteilingen Der Gesellschaft Fur Erdkunde zu Leipzig —1931-32.

The Scottish Geographical Magazine—May and July 1934.

The Himalayan Journal—Volume VI : 1934.

Geography—June 1934.

The Journal of India History—April 1934.

The Geographical Review—July 1934.

The Indian Educator—June and July 1934.

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Hill-Climbing in South India

By

Mr. N. Subrahmanyam, M.A., L.T., F.R.G.S.,

A meeting of the Association was held on the 15th Sept. 1934 at the University Geography Department, Wesley College, Royapettah when *Mr. N. Subrahmanyam,* M.A., L.T., F.R.G.S., Lecturer in Geography, Teachers' College Saidapet delivered a lecture on "*Hill-Climbing in South India*". *Miss J. M. Gerrard,* M.A., Principal, Lady Willingdon Training College and President of the Association, occupied the chair.

In her introductory remarks the President said that excursions afford the best means of knowing the Geography of a country, and Hill-Climbing is the best form of such excursions. She hoped that the lecturer of the evening, who is an enthusiast in Hill-Climbing, would inspire others to take a lively interest in it.

Then Mr. N. Subrahmanyam delivered the following lecture :

Hill-climbing is one of the most fascinating of out-door pastimes. I had opportunities of practising it from my school-days owing to the influence of an uncle of mine with whom week-end excursions was a passion. After I became a teacher and a teacher of Geography I had further opportunities of carrying it on. All these years I have done a large number of hills in South India, not only on the Nilgiris but also all over the plains. Excepting the forest officers whose duty takes them there, I believe few other laymen would have done so much hill-climbing in this part of the world. The wealth of experience thus gained has tempted me to place before you some aspects of hill-climbing that may be of interest not only to prospective

hill-climbers but also to stay-at-home people who have not tasted the joys thereof. I wish hill-climbing becomes a popular hobby at least with our young men. The joy of planning for it, the joy of surmounting difficulties of all kinds, the enjoyment and appreciation of the beauty of physical and human landscape, not to speak of the invaluable help in the study of real geography —these delights are unique and incommunicable, and are better experienced than described.

Instead of tiring you with personal anecdotes and particular events, I propose to address you in a more general way, dividing my subject into three parts as follows: (1) The Joys and Values of Hill-Climbing; (2) Its Dangers and Difficulties; and (3) Some Hints and Tips for Prospective Climbers.

The Joys and Values of Hill-Climbing.—Stay-at-home people, who have not ventured out and have not tasted the pleasures of climbing usually exaggerate the dangers and difficulties of hill-climbing, while they discount very highly the joys and compensations for all the trouble and treat them as almost negligible or not worth while. There is no good of arguing with them; the best thing is to persuade them to join a party to hills of low heights—preferably to shrines which they would like to visit, places like Tirupparankunram, Palni, Narasimha Konda, and Simhachalam. Having got them up, we have only to appeal to their aesthetic sense; and their eyes are opened. On subsequent occasions less and less effort is required in getting them out; and they are prepared to venture out for bigger and more strenuous jobs. Not only have they learnt that it was worth while, but that they could stand it. I have converted several persons in this way; and they have subsequently become inveterate climbers. It is the first step—the first hill, however low, that is the most difficult; for, great is the strength of human inertia, associated as it always is with prejudice. The hot sun and the hard breathing that appeared so stupendous at first do not count after a time; for, you learn instinctively to get out of their evil effects by little subterfuges.

Mountains form one of the finest features of Nature; and there is almost infinite variety in the scenery afforded by them. The blue tints of the distant hills, shades of green verdure as you approach them nearer with the multi-coloured gorgeous flowers, the sound of the falling waters, the rustling of the

leaves and the varied chirping of the birds, the changing view of the hill and valley, ridge and gorge, all these and many other features of natural scenery, too numerous to be catalogued, greet you and feed your aesthetic sense as you trudge along, and cheer you up in your laborious ascent. Even the weird barrenness of some places with their craggy knolls, and bluffs and boulders have their own majestic beauty. Very few of us think of the aesthetic side at all. I think it was Dr. Vaughan Cornish in his Presidential Address to the Royal Geographical Society some years ago that took for his theme "Outlines of Aesthetic Geography", in which he analysed the beauty of various kinds of natural scenery. Hill-climbers will find it very interesting, as it voices forth their own experiences. The mist and the cloud, the foliage and the flowers, the changing hues of the morning and evening sky on the hill forms and the changing aspects of the seasons—all these afford an infinite variety and wealth of beauty that requires the seeing eye to observe and appreciate. All this is part of the compensation for the trouble of going up.

But more of it is awaiting you at the hill-top. The joy of looking at the varied prospect of the surrounding country is something unique. The changing panorama of forests and fields, dry crops and wet crops with waving corn forming geometrical patterns, meandering streams and bunded tanks, human settlements forming nodes at favourable places with avenued roads linking them, the railway line with its embankments and cuttings keeping a fairly level course, or a dissected highland like a stormy sea petrified, sometimes barren and sometimes with rank vegetation in hollows and valley-lines,—all this and several other types of mingled scenery of physical and human landscape present themselves to the view from the hill-top. You look at things in their natural setting and right perspective from the hill-top, which is the natural outlook tower, the proper place of vantage from which an ocular grip of the surrounding country can be easily obtained and its Geography studied with a sense of reality. An air-view of the country is thereby available without going on the aeroplane.

Then there is the joy of surmounting difficulties. When you decide to go up, you have bargained for difficulties of various kinds, both expected and unexpected, as will be shown later on. And the roughing and the discipline got out of surmounting them

one after another affords an excellent training of character ultimately; but in the first instance the joy of surmounting them is immense indeed. One who has climbed hills readily appreciates the truth of the statement that difficulties are *meant* to be surmounted, and goes about courting them for the sake of the greater joy that is in store than that to be obtained in a quieter way. The joy of achievement is worth all the trouble.

Besides the subjective pleasure and the training of character, there is also the instructional side, the immense educational value of hill-climbing. On the hill-slopes as you ascend, on the hill-top after ascent and from the hill-top the view around—in all these there is a good deal to learn.

On the mathematical side there is the measurement of heights and distances, and of the slope and the gradient. Geologically, the types of rocks and minerals, weathering and erosion, are some of the topics for field study. On the botanical side the types of vegetation changing with altitude, the occurrence of peculiar forms not to be found on the plains, etc., will afford scope for study; while on the zoological side a similar study will be equally interesting. On the human side the utilisation of hill and forest produce, the rocks and minerals of any special value, any peculiar types of hill cultivation and modes of life of the hill people such as those of the Malayalis on the Jawwadi Hills—all these form interesting topics of study. On the plateau of the Elagiri Hills near Jalarpet, we have villages and cultivated lands with crops, orchards and plantations which interested us very much, and the botanist in our excursion party told us that he found on the highest peak rising over the plateau new types of plants which he had not seen before; and he took several specimens with him. The vegetation and crops suited to the temperature and moisture conditions at that elevation afford scope for interesting study. Sometimes the methods of transport of produce, manure or merchandise is peculiar; we found for example pack animals such as donkeys and oxen used for the purpose and it is interesting to note the similarity of method at such distant places as Elagiri and Gandikota. Once as we were walking along on the Erramalai plateau on the Cuddappah formations some miles from Tadpatri, it was interesting to note how in a plateau village the people had to provide themselves with water in their barrel-carts every morning from the foot of the hill two miles off. All these and other similar adjustments to

their particular environmental conditions make interesting and instructive study. If in our excursion to the hill we take with us the one-inch map, we are enabled to get from that mine of information a good deal of valuable guidance which cannot be had otherwise. The location of features and places with the help of the map and the comparison of the contours therein with the actual shapes and features on the hill will afford scope for exercises in map study.

Hill-climbing in India has also its archaeological and historical aspect of study; for, most hills that have any advantage of location, or command a large area of country, or have a defensible or practically impregnable build have been fortified and used as capitals or as outposts for the defence of the land by the kings of former days. I have had the good fortune to climb up and study several of these in distant parts of the country; and the following are some of the more important of them:—Kondapalle, Kondavidu, Gooty, Penukonda, Chandragiri, Vellore, Kailasgarh, Karnatgarh, Kidambur, Gingee, Gandikota, Sankari Droog, Krishnagiri, Nandidroog, etc. Standing on one of these fortresses and surveying the country round, if one attempts to appreciate the importance of the site and recalls in imagination the doings of the kings and armies and the common men when the fort was a live one, one will be able to make the past live; and if a peep at the past is thus given to the pupil, history ceases to be a fossil study that it unfortunately is so often made to be, and becomes extremely absorbing and romantic. It is easily possible to correlate the visit to the hill-fortresses with the study of local history.

There is again another aspect to this study of the hill fortresses. When one visits a number of them, one finds that there is an extraordinary similarity in them in several respects—in their defences, in their secret passages of escape, in their dungeons and prisons, in their method of storing grain and collecting water for various purposes in secret and open reservoirs, etc. From these common features, it is certain that the art of planning and construction of hill fortresses must have been a highly developed one in India. The granary at Gingee, the lotus tank at Chandragiri, the secret reservoir at Krishnagiri, the armoury at Gooty and Kondapalle, the arched hall at Gandikota, the powder magazine at Karnatgarh, etc., are some of the unique features, well worth a visit.

In several of the hill fortresses, it is interesting to find different styles of architecture such as Vijayanagar, Mahratta and Moslem, as they passed successively into the hands of different rulers; and the temples and mosques in some of them have their own peculiarities of architecture.

I think I have spoken enough of the joys and values of hill-climbing in South India. Let me next indicate some of its dangers and difficulties—especially on the plains.

Dangers and Difficulties of Hill-Climbing.—People who have climbed the peaks on the Nilgiris and who have not done the hills in the plains cannot appreciate this section of my talk at its full worth. Every hill-climber in the plains has first to guard against the danger from wild animals. It is always desirable that you go with a guide, who not only knows the right way but also the usual haunts of cheetahs, tigers, wild bears, etc., and their habits. I got the thrill of my life on two occasions when I neglected the precaution of either taking a guide or making an enquiry as to whether the neighbourhood was haunted or not. On the first occasion several years ago, two of us climbed the steep slope of a hill near Kumili Ghat in Vizianagaram at evening time, not knowing then that evening hours are to be avoided near forests and hills as wild animals begin to prowl just about that time in search of their prey. A resounding echo of a growl from the opposite hill showed us our folly; and we rolled down a half-hour's difficult climb in two minutes and ran for three miles in the plains before we had courage to turn back. On the second occasion, I was climbing Bezwada Hill from the western side by way of variety on an afternoon, and when I was half-way up, a large crowd gathered at the foot of the hill and bawled and beckoned to me to come down immediately. It seems for about a week the hill was haunted by a stray tiger.

But when we do the hills by daytime and with proper guides who know the locality, there is little danger of wild animals. We have also to guard against snakes when we are passing through bushy and forested paths. We have to keep our eyes and ears always open to all the sights and sounds, as we pass along.

Thorns of various kinds are a nuisance when you are climbing by unfrequented ways with unshod feet. Sometimes thorny

bushes and creepers tear off your clothes and your skin too, if you are careless. Walking on the gravelly path on stones with sharp angles is sometimes a very painful process. Climbing up Karnatgarh recently, the unshod among us suffered immensely, while people like me who had shoes on suffered in a different way from blisters as a result of the continuous rubbing of the feet by the shoes. Sometimes the pathway is steep and slippery, when also all your skill is required in saving yourselves from slipping, whether you are with or without shoes.

Hill-climbing in the plains has got its own peculiar dangers and difficulties from which you are free on the Nilgiris; and they arise largely from the difference in weather conditions. Climbing Dodabetta or Snowdon on the Nilgiris, you feel it is most exhilarating which is due to the weather; but on the plains you try to climb a hill of similar height, say Gingee, Urachikottai, or Vellore Hill, it is found very enervating; and when you attempt higher hills which are more than 2000 feet from the foot such as Nagari Nose, Karnatgarh, Tiruvannamalai and Elagiri, you run the risk of getting heat stroke, if not sun-stroke, unless you choose your season and time of day aright and take certain other precautions besides. Christmas is the best time for attempting some of the higher hills on the plains of South India; and it may be done conveniently for a month before and after. I quite well remember the difference that a month's interval made in the case of Nagari Nose (2400 feet from the foot). I did it with one party during Christmas, when it was quite enjoyable; but, repeating it with another party just a month after at the end of January, it was comparatively more tiresome and enervating, and the difference in temperature was distinctly felt.

Again, the sun begins to be powerful in South India after about 8 o'clock in summer and after about 10 o'clock in winter; and it is therefore desirable and even necessary to do as much of it as possible in the cool hours of the morning, and not waste time in waiting for *chota* or coffee. Everything should be carefully arranged overnight; and whatever food or drink is needed should be got sufficiently early to enable the party to be at the foot of the hill at dawn when you are just able to see, ready for the climb. I used to be generally careful about the start; but we paid the penalty owing to the failure to observe this precaution recently, when we climbed Karnatgarh (over 2500 feet from the foot) during August last with a party of nearly a hundred and fifty persons. The ordering

of things was not then in my hands; and our kind host who made all the arrangements for us in the best manner possible, however, committed one blunder without knowing it and that was to give us food rather late so that we had to start a couple of hours after sunrise with yet an hour's walk to the foot of the hill. The result was we got enervated and exhausted soon enough and could reach the top only by mid-day instead of by 9 or 9-30 a.m., as was intended. Not only did we get terribly tired, our period of stay on the hill-top had to be reduced; for, we had arranged to come down the same evening. No doubt the cool air at the top revived our energies, and made us fit for the descent.

Lastly, there is the individual factor. The hill-climber should keep himself fit and healthy, and should possess a good heart. People unaccustomed to it easily get out of breath. It is good to remember the truth of the statement that it is the pace that kills; and it is desirable that beginners and persons on the wrong side of 40 or 45 do it at their own pace, taking frequent rest. The test of suitable pace is that the individual should be able to enjoy the ascent and the scenery, and should not get anxious, uneasy or seedy. If there is one or more in the party who get easily tired and lag behind, the leader should see to it that somebody with grit and stamina is left behind to wait and come with him at his own pace, cheering him up. For, if any tired person is left behind, he gets easily disheartened and demoralised and would find it impossible either to go forward or backward.

More than hunger, it is thirst that troubles a good deal the hill-climber in the plains. On the Nilgiris there is no such thing. And failure to quench the thirst increases the exhaustion; but, at the same time it is not desirable to gulp down tumblers of water. My advice is that each climber has his own water-bottle with safe water in it, but only sips it very occasionally. Sucking a lime-fruit is again a desirable thing to do. Chocolates and sweets supply ready food; and juicy fruits are food and drink in one; and they are all easy to carry too. A person with weak limbs or unaccustomed to long walks or to strenuous work sometimes gets cramps when he climbs up. The only remedy that I know of is to massage the portion in a gentle manner and slacken the pace, and do it with more frequent rest intervals. Hunger, thirst, hard breathing, exhaustion and cramp are the five chief personal difficulties that the individual is likely to suffer from; and I have indicated above how these can be got over successfully. The need

or a good heart cannot be sufficiently emphasised, especially in the ase of convalescent persons and those on the wrong side of forty. But very often people mistake any tightness of the chest due to ndigestion, constipation or flatulence for a weak heart. The narvel often happens of hill-climbing relieving such persons and naking them fitter by removing the cause.

Some Hints and Tips to Prospective Hill-Climbers. For hill-limbing in the plains cotton dress is the most pleasant and com-ortable; and silk and wool should be avoided as far as possible, inless you are staying on the hill-top over-night. It is desirable o wear glare-protectors to protect the eyes from the glare of the right sun and white clouds; otherwise, nervous energy oozes out hrough the eyes, as it were, and you soon feel very jaded. Pro-ection against the sun is needed for the head also, even if it be n the shape of an upper cloth or a towel; otherwise, the advanc-ng sun acts directly on the brain, and you render yourself more asily liable to get sunstroke or heatstroke. A tough and hard valking stick is practically a necessity both in climbing up and in limbing down; thereby both ascent and descent are rendered con-iderably safer, easier and quicker. Again, a stick comes in handy or several other obvious uses. Concentrated and nourishing food nd safe water have already been mentioned under the previous ection as things quite indispensable in hill-climbing in the plains.

The one-inch map of the hill and of the surrounding country s an absolute necessity, if there is any desire to make a fairly full nd useful study of the region. Even otherwise, it will serve as a airly accurate and reliable guide and a mine of interesting infor-nation. If a field-glass helps better appreciation of the views round, a good camera will help some of the important views to be aken as a permanent possession. A small empty bag will be need-d for taking collections of specimens of rocks, plants, etc., while a ocket-book and a pencil will be required not only for taking notes ut also for making sketches and drawings.

Hill-climbing requires more careful planning than any other kind of excursion, as risks and dangers as well as difficulties are reater here. Great care should be taken to eliminate weak and nfit persons, not only to avoid risks but also to make the party njoyable. There must be a general understanding that members f the party do not scatter themselves and lose themselves from ach other, but are within earshot of each other. There is no

doubt the temptation of unbridled youth to rush forward and be the first to reach the top; but in the general interests of the whole party it should be kept under curb. It is always a safe rule to regulate the pace of the whole party by that of the weakest in it; for it is the pace that kills. Slow steady pace and rhythmic breathing make the ascent pleasant and enjoyable, putting the party in a mood to study and appreciate and get the best educational values out of the hill-climb.

Very often an excursion, including a hill excursion, is treated merely as an opportunity for outdoor activity and enjoyment; and the full educational values of it are missed when students form the party, by omitting the follow-up work after return to the school. Even for others it is very beneficial to recall and rehearse what has been observed and noted so that it may get fixed in the mind.

In conclusion, I wish to suggest to the members of the Madras Geographical Association, especially to the younger ones among them, the advisability of developing hill-climbing as a new activity of the Association, doing it in a systematic way. If a start is made with hills near enough, it will be possible in course of time to gather a record of achievements near and far. There is no reason why some of them should not train themselves for and plan and carry out Himalayan and other similar expeditions in course of time.

After the lecture was over in her concluding remarks, the President spoke as follows:—

" The lecturer has delivered a most enthralling address on the subject and has tried to explain something of that fascination for hill-climbing which only climbers are aware of. It is an extraordinarily difficult thing to explain. It is an impossible thing for a mountaineer to explain the nature of his enthusiasm to any one to whom the susceptibilities of the atmosphere of the hills have been denied. The fascination of mountain climbing is something that is really inexplicable. There is an extraordinary lure about it.

Of course, enormous effort is involved in hill-climbing. Sometimes it so happens that the hill-climber sustains just that energy to reach the top and then falls down very tired and exhausted. But the rejuvenation at the top is certainly tremendous and immense. Then again there is the joy of overcoming difficulties and that is of

tremendous value in disciplining the individual. On the hill-top you have to meet with dangers from animals and plants and that gives you extraordinary power and resourcefulness that seems to come with you when you come down.

The lecturer also gave us some practical hints about hill-climbing and as he points out, hill-climbing in this part of the world is much more difficult than in any other part of the world. It is always good to practise hill-climbing with shoes on, for then the heels give you a stronger hold on the slippery rocks. We in our parts use a pair of socks for each leg and often times annoint our legs with some grease, to avoid blisters. You feel very thirsty; and it is a bad thing to go on drinking as you go on climbing. I would suggest to you the use of lime fruits. All these little things help us a long way in comfortably climbing the hills. We must venture out with a small group and often it is good to have a company of our own age and experience." The President then read a poem from an old cutting of "The Hindu" showing the fascination that hills have. She said that some of the hills in the Agency tracts seem to be very attractive from that article. Referring to the desirability of having a hill-climbing club she said that it would be better to get hold of people like the lecturer of the evening who could give the necessary inspiration and visit many of the hills in South India.

With a vote of thanks to the Chairman and the Lecturer proposed by Mr. T. S. Krishnamurthi Ayyar, the meeting came to a close.

The Forests of Southern India

By

Mr. A. Wimbush,

Chief Conservator of Forests, Madras.

Under the auspices of the Madras Geographical Association Mr. A. Wimbush, Chief Conservator of Forests, delivered an interesting lecture on "Forests in South India" in the University Geography Department, Wesley College, Royapettah, on Tuesday, the 27th November, 1934, with Mr. S. V. Ramamurthi, Director of Agriculture in the Chair.

The Chairman, Mr. S. V. Ramamurthi in requesting Mr. Wimbush to deliver the address said that he was very glad to preside over an occasion when the Chief Conservator of Forests was going to deliver a lecture on "Forests in South India."

Mr. Wimbush then delivered the following lecture :—

When asked to give a lecture on "The Forests of Southern India" to the Madras Geographical Association I had considerable misgivings in view of my comparative ignorance of geography and also my ignorance as to the sort of things connected with forestry that would be of interest to the members of the Association. However, after thinking the matter over and being assured that the members would be interested to hear something about the forests, even though it were not very intimately connected with geography, I consented to do my best.

There are a great many different types of forests in South India probably many more than in the North. Over vast areas in the North there are forests a great portion of which contain one predominant species—Sal. Again in the Himalayas although different types are met with, yet the number of these types is comparatively small. In the Himalayas the predominant species are conifers of several varieties.

Now in the South of India there are many diverse climates, and places at no great distance apart vary tremendously in the matter of rainfall. Again every elevation is met with in South

India from sea level up to over 8000 ft. and in a great many districts there are hill ranges of greater or less extent going up to elevations of—say—3000 to 5000 ft.

Rainfall and elevation perhaps play the greatest part in influencing the type of forests found in different localities. But there are other things, as for instance, the nature of the soil and underlying rock which are also important. I think that before we go any further it will be interesting to name some of the chief types of forests found in Southern India and indicate roughly on the map where they can be found.

In thinking of forests my thoughts automatically turn first to the west; for, roughly speaking, it is on the west of the peninsula that our most important forests in Madras are found. Between the sea and the Western Ghauts much of the land is of course under cultivation; but a typical feature is the series of low hills, frequently of a lateritic nature, which are interspersed amongst the paddy fields. These low hills for the most part contain a deciduous type of forest, that is to say, one in which the trees are leafless during an appreciable time in the hot weather. There are, however, places in this tract of the country where a type of forest almost or entirely evergreen occurs. On ascending the Western Ghauts from the west the type of forest becomes more and more evergreen and in fact after ascending a few thousand feet we enter what are termed the tropical rain forests. There are many different species of trees in these tropical rain forests and, for the most part, the species are quite different from those found in the deciduous forests already mentioned. The trees grow to enormous heights. The crowns form a completely closed canopy overhead and during the hottest time of the year it is possible to walk about in complete comfort without a hat on. These tropical rain forests stretch from the North of the Presidency in South Kanara right down through Malabar to the Palghat gap and further South than that they are found along the frontier between Travancore and Tinnevelly as well as in the Anamalai Hills and various outliers from the Ghauts including the High Wavy Mountain in Madura district. On the tops of the hills, as for instance the Nilgiris, we get above the typical tropical rain forests, into another type where the growth, although still evergreen, is very much smaller both in height and thickness. This type is known as shola and those of you who have been to the Nilgiris or Palnis will be familiar with the rolling Downs covered with short grass intermingled

with the well known sholas which occupy so many of the moist depressions on the plateaus.

Some of the most interesting and valuable timber forests in South India lie on hilly ground intermediate between the forests of the plains and the tropical rain forests. Such forests are found in the Wynaad of Malabar and Nilgiri districts and the west of the Anamalais at elevations between about 2000 and 3000 ft. These forests are typically deciduous and the most important tree which they contain is the famous teak. In nature teak does not grow gregariously i.e. as a pure crop. On the contrary it is found scattered amongst numerous other deciduous species only a very limited number of which are of economic value.

Going eastwards from the Western Ghauts we rapidly get into areas where the rainfall is very much less than it is on the west and south of the Ghauts. In places the change in rainfall occurs at an interval of very few miles, for instance near the Palghat gap which as you know is the gap in the Western Ghauts through which the railway from Madras to Calicut and Mangalore passes. The rainfall in Malabar on the west of this gap probably exceeds 100 inches whereas a few miles on the east of the gap the rainfall is less than 30″. All this has an immediate influence upon the types of forest which are found. As we get to the east trees are very much smaller both in height and in diameter, and over vast areas stretching from the eastern side of the Western Ghauts practically up to the east coast, the forest may be described as mixed deciduous fuel forests. There are vast numbers of different species in these forests, some of economic value and some comparatively worthless and a great many of the species are entirely different from those found on the west of the Ghauts and of course are completely different in species and appearance from those found in the tropical rain forests.

Roughly speaking in the centre of Southern India including large parts of Mysore and Coorg we have a large tract of country with very moderate rainfall and at an elevation of about 2000 ft. rising to 3000 or 4000 ft. on many of the hill ranges which are so common in this part of the country. This tract of country is the home of the famous sandalwood. Sandalwood like teak is not gregarious but grows scattered about amongst deciduous species and for some reason or other it is particularly fond of the hedgerows and old village sites in the neighbourhood of cultivation,

On approaching the East Coast for instance in Chingleput district, a type of forest is met with which is semi-evergreen in character. Many of the species are quite different from those met with further to the west and although many of the individual trees are leafless during part of the hot weather yet much of the undergrowth and shrubs retain their leaves with the result that you never get the completely leafless appearance so characteristic of true deciduous forest in the hot weather.

Further to the North on the East Coast are found what are known as Mangrove forests. These forests form a distinct type of their own. Several different species are found in these mangrove forests and the chief factor influencing the constitution of these forests is the tide which submerges portions of the area covered by these forests twice every twenty-four hours. Some of the species in these tidal forests are provided with curious knee joints which enable them to breathe even though their main root system may be submerged by the sea water. On the very north of the East Coast of the Presidency are found the only Sal forests which exist in the Madras Presidency. They form the South-eastern extremity of the vast sal belt which stretches through Bihar and Orissa, Bengal and Assam and along the foot of the Himalayas up into Nepal, where sal probably is at its optimum. In Ganjam the sal is found growing pure in certain favourable pockets whilst in between the patches of pure sal are deciduous forests of other species.

Having mentioned some of the main types of forests in Southern India it is necessary to point out that each one contains various sub-types which it is not necessary to try to describe in detail. For instance, I have given to one type the name of the deciduous fuel forests. It must be understood that within this type are to be found forests ranging from open thorny scrub forest to a forest of much better quality producing a mixture of species which may grow—say—to the size of telegraph poles. Probably each locality in the world is capable of carrying what is termed a climax type of forest, that is to say, if no external influences such as men, fire, etc., were ever allowed to play a part in the development of the forest a certain type of forest would be evolved by nature as being the one best suited to the particular locality. In Southern India there are at present very few forests which have reached the climax type. No doubt the Nilgiri sholas and parts of the virgin tropical rain forests on the Ghauts may be said to be climax type

since if all external influences, more especially man, were to be removed from the face of the earth the probability is that these particular types of forest would remain as they are at present. It is possible that some of the tidal mangrove forests may also have attained their climax.

It would perhaps be interesting to give some sort of idea as to why a limited number of species tend to grow gregariously, that is to say, to form pure crops of their own to the exclusion of other species. Various factors no doubt give rise to this gregarious form of growth. If a particular species seeds prolifically, germinates as soon as the seed reaches the ground and having germinated is able to stand a considerable degree of shade over its head then supposing that in these respects that it has the advantage over any other species which would otherwise grow on the area, that particular species tends to form pure crops. This presupposes that the soil, climate and other essential influences are completely favourable to the species in question. Such a species is sal of which the botanical name is Shorea robusta.

It must be understood that types of forest which are subjected to external influences, most of which are connected with the existence of man, are not permanent or constant but are subject to material changes; for instance if an evergreen forest is cut down by man the regrowth which will spring up on the area will be of an entirely different type from that which has been cut down and it will contain a large proportion of quick growing deciduous species. Should a forest fire get into such an area after the felling of the evergreen forest the change of type will be even more marked and for many many years afterwards a much degraded type of forest will be found in place of what previously may have been a most excellent evergreen forest. The reverse of this process is also taking place over many of the reserved forests of Southern India. Before the Forest Department came into existence and before the Madras Forest Act was passed in 1882 the forests of Southern India were subjected to very severe mishandling at the hands of man. Not only was felling carried out indiscriminately but forest fires were rampant with the result that many areas capable of producing fine forest crops were only covered by a very much degraded type of forest in which the soil had deteriorated owing to constant exposure. Since the Forest Department took over the management of these areas the forests have been afforded a great degree of protection from excessive felling and from fire

with the result that by degrees the forest is being restored to its normal type. This process of restoration is necessarily a very very slow one. There are cases, however, where it has proceeded far enough to bring about a tendency for a forest which contained a degraded type of deciduous growth 50 years ago, to become evergreen. Instances of the two processes of destruction and restoration are to be seen in many parts of the Presidency. Round Salem for instance as you travel on the railway it is possible to study both processes. To the south of Salem Town may be seen a range of hills which is virtually devoid of any tree growth. This range of hills which I have in mind is not in the charge of the Forest Department. To the north of Salem Town are the Shevaroy Hills and the slopes of these hills which are in the charge of the Forest Department may be seen to be covered with a thick growth of forest. There is one place which I call to mind alongside the bridle path leading up the Shevaroy Hills, where the whole process is apparent to the most casual observer. A cut line separates the Government reserve forests from an area which is not reserved. At this point quite a sharp distinction in the growth on either side of the line is most noticeable.

It is now necessary to consider the effects which forests have upon any country and more especially on the tropical countries such as South India. Forests have an appreciable effect upon the climate of the locality and they tend to make the climate more equable: that is to say less hot in summer and less cold in winter. Anyone who has had the opportunity of walking in a forest country during the heat of the day must have noticed that on entering a patch of really heavy forest the temperature is very appreciably lower than that in the country outside the forest. In South India it is only on the higher hills that frost occurs but if any of you have been at Ootacamund or Kodaikanal in the winter time you may possibly have noticed that whereas it has been extremely cold whilst you walked in the open grass land, a marked rise in temperature is noticed as soon as you enter a shola.

It is doubtful whether forests increase the actual amount of rain which falls in any given locality. It is after the rain has fallen that forests play the most important part. You will all realise that if you have a piece of blotting paper in front of you on a sloping desk and have the misfortune to upset your ink pot on the desk the ink will run away from the bare wood and probably soil your clothes whereas it will not flow away rapidly from the

place where the blotting paper is. Now this is almost precisely what happens when rain falls on a hilly area. The forests take the place of the blotting paper. After a heavy shower of rain water will flow very rapidly off the bare portions of a hillside ; but where a forest exists the water will be held up and instead of rushing off the surface of the earth it will tend to soak gradually into the earth. The result is that forests play the most important part in the storage of water which as you know is of importance in a country like South India.

By holding up the water in this way forests also prevent erosion. In a hilly country where the forests have been removed not only does rain water rush off very rapidly but it also carries with it great quantities of the surface soil. This soil is carried down the various nullas and often is deposited in the form of silt upon the agricultural lands at the foot of the hill, which of course is very bad for agriculture. In such a country when abnormally heavy rain occurs in addition to the erosion which takes place the danger of floods is greatly increased, for instead of the water being released by degrees and, after soaking into the earth, tending to raise the general level of the water table of the country at the bottom of the hills, the water flows away with the greatest rapidity and if any obstruction such as a railway embankment comes in its way floods are formed and as you know very great damage may be done to the surrounding country.

Forests are of use not only in holding up water as already described but in some places in holding up drifting sand. In some parts of the world this question of shifting sand is of very much greater importance than it is in South India. There is, however, one place, which some of you may have visited or heard of, where shifting sand is a source of considerable damage. I refer to the neighbourhood of Nazareth in Tinnevelly district where there is a vast area known as Kudiramoliteri. Here the nature of the soil is loose sand and at certain times of the year when strong winds blow this sand is carried off the Teri and is deposited on the agricultural lands on the other side. For many years the Forest Department has been trying to arrest the drift of this sand. It will be readily understood that if a forest of trees could be grown on this sandy land the effect would be to prevent the sand from being blown off the area. Unfortunately the creation of a crop of trees in this locality, which is almost of the desert type, is extremely difficult especially owing to the fact that herds of semi-wild cattle

roam over the area and delight in eating any young trees which may appear. The way to tackle this problem is to start on the side of the area from which the prevailing wind comes. If a belt of trees can be grown on this windward side it will produce a belt of protection on its leeward side. Beyond this belt of protection other growth can gradually be introduced and in the course of many years the protected belt can be made wider and wider until eventually it may extend right across the desert area.

So far I have confined myself to telling you about what we call natural forests. In addition to these natural forests there are in Southern India many *plantations,* for instance on the Nilgiris are many plantations of the well known *Bluegum* which is a Eucalyptus from Australia, which is planted in order to supply the large quantity of firewood required in the various hill stations. In addition to Eucalyptus there is a certain amount of *Wattle* which produces the beautiful yellow mimosa flowers which you may have seen. This species also is confined to the higher hill ranges and like the Eucalyptus it is a native of Australia. One species of wattle produces excellent bark for tanning and a private gentleman on the Nilgiris has planted up many acres of it in the hopes of selling it to the Madras tanners. By far the most important species, however, that is planted by the Forest Department is *teak.* This is grown in Malabar and on the Anamalais as well as in the Wynaad and elsewhere in suitable localities. The Nilambur teak plantations in Malabar are world famous. The first plantation there was made by a Collector called Mr. Connolly in the year 1842. The oldest plantations have now become mature and the final crop is being clear felled each year and a new crop is being planted up on the same ground.

An interesting development of comparatively recent years in the Madras forests is the combination of agriculture and forestry. You may or may not know that in various parts of the country some of the more backward tribes have for generations been in the habit of cutting down and burning the forest on hills and sowing food grains on the area. Their habit is to use the same place only for one or two years and then cut down a fresh bit of forest and repeat the operation. Needless to say this is extremely destructive and is forbidden in our forests as a rule. We have, however, devised a means of utilising this form of rough agriculture to our own ends. In an area on which we wish to raise a teak plantation we first fell and remove all sale-

able trees and we then hand over the area to the jungle tribes who cut down the balance of the trees, burn them, and raise a crop of food grains, usually ragi or hill paddy. At the same time as they are preparing the ground for their cereal crop we plant teak stumps usually at an espacement of 6′ x 6′ and these grow up along with the cereal crop. The hillmen weed their cereal crop and look after our teak trees with the result that after the cereal crop has been harvested we have a teak plantation on the area. This system of combining agriculture and forestry has numerous different names in different parts of the country. The Burmese term is the one most universally known and it is called Taungya. In different parts of Madras it is known as podu, kumri, ponakad, tuckle, etc.

Having told you about the different types of forests in South India I think you will now be interested to hear something about their inhabitants. Our forests contain many things besides trees—some of them extremely nice and some exactly the reverse. I may first mention a few of the unpleasant inhabitants of the forests which forest officers have to look out for. *First of all there is the leech* which lives in its millions in the tropical rain forests. In the *dry weather none of these creatures are* to be found but as soon as the rain begins out they come and attach themselves to any human being who enters the forests. They suck the blood and make a nasty wound. Naturally forest officers and others have devised means of mitigating this nuisance. One way of keeping off leeches is to tie a band of country tobacco round the top of one's boots. Another enemy of the forest officer is the *grass tick*. These pernicious insects live in the deciduous forests and are most active during the dry weather. They are minute in size and difficult to see but their bite is most poisonous and irritating. The way to deal with them is to smear one's body with an emulsion of kerosene oil and soap after coming back from the jungle before taking one's bath. Another thing which we have to be on the look out for in the tropical rain forests is the *devil's nettle*. This is a shrub growing to about 15′ in height which has a most innocent appearance but which if touched will cause irritation which is so bad that it induces fever in the case of some people and is in any case enough to keep one awake at night in considerable pain.

The more attractive inhabitants of our forests are fortunately numerous. To start with there are the various *jungle tribes* such as Kurumbars, Kaders, Mulsers, Khonds, etc. Most of these people are extremely simple and unsophisticated and are the very

good friends of forest officers. Some of them, as for instance the Chenchus in the Nallamalais of Kurnool, have a criminal tendency but for years the Forest Department has been spending large sums of money in civilising these people who are gradually becoming more and more amenable; like man-eating tigers they seldom interfere with forest officers.

Of the animals that live in our forests probably the *elephant* is the best known. Generally speaking these animals live in the better types of forest, for instance in the Wynaad and Anamalais and Malabar. They enter the tropical rain forests in large numbers at certain times of the year whereas most other jungle animals are comparatively rare inside these dark evergreen forests. Elephants are migratory in habit and at certain seasons of the year they roam from the west right through Coorg, Mysore and the Wynaad towards the Biligirirangan Hills and Bargur Hills of North Coimbatore and Kollegal. We catch these elephants in pits and use them for dragging our timber. Other most attractive animals are *Bison.* These enormous cattle stand as high as a big horse. They are very shy creatures and as a rule do no harm to anybody. Generally speaking they inhabit the same type of forest as the elephants do. *Tigers, panthers, boars, wild dogs and other predatory animals* are found in varying numbers throughout many of our forests. Their chief object in life is to keep out of the way of man and, except in rare instances where, for instance, an *old or wounded tiger has become a man-eater, they are of* very little danger to human beings. Other forest dwellers are various *species of deer* notably the sambhur and spotted deer. Sambhur live mostly on the hill ranges whereas spotted deer frequent the open grassy glades in the bamboo forests at lower altitudes. Deer especially are subjected to terrible persecution from men and in many places, where formerly they used to be common, they are in danger of extinction. This is largely due to the pernicious habit of shooting from motor cars and by the light of electric devices during the night time, a procedure which cannot be too strongly condemned as being thoroughly unsporting.

In conclusion you might be interested to know a few of the *main functions of the Forest Department.* You will I hope have realised from the early part of my lecture the supreme importance of forests to the country as a whole from the point of view of protection and conservation of water supply. The forests are also,

of course, a great source of revenue to the State and one function of the Forest Department is to harvest the legitimate revenue which the forests can produce whilst at the same time preserving and increasing their protective value. In forestry the tree crop and the soil on which it grows represent the capital of the business. Each year the crop grows and puts on what is known as annual increment. This annual increment is the interest which the capital produces. Now the difficulty is that it is impossible for the lay man to differentiate between the capital and the interest since they are so intimately connected together. Unless the greatest care, therefore, is exercised nothing is easier than to cut out more trees than the equivalent of the interest in order to make more money and in the process infringe upon capital. In privately owned forest where the owner of the day is usually in need of ready cash the capital is constantly being infringed upon with the result that in the course of years the forest deteriorates. In the case of the Forest Department who manage the Government reserved forests most careful working plans are made which prescribe the legitimate amount of felling which may be done each year for a number of years in advance. Obviously it is impossible to harvest the increment or interest from each individual tree. So what is done, broadly speaking, is to calculate the volume of timber which is equal to the total annual increment and then to remove this each year in the form of full-grown mature trees.

A great part of a Forest Officer's work of course relates to the protection of the forest from the depredations of man. They are helped in this by the Madras Forests Act of 1882 which gives them the necessary powers. This prevention of cutting trees which forest officers always have to insist upon naturally results in the Forest Department being not very popular with the people. The people cannot understand why if they want a bundle of sticks for their fire they should not be allowed to cut and remove them from the vast areas of forest that exist in the presidency. What a forest officer has to bear in mind, however, is the fact that although very little harm may result from one old woman collecting a bundle of sticks for her fire yet if the 350 million people in India all started collecting bundles of sticks for their fires there would very soon be no sticks left either for them or for their descendants.

Finally I may say that if this talk of mine has created an interest in the forest in the minds of any of my listeners who are

instructors of the young I hope that these instructors will do all that is in their power to interest the young generation in the forests and animals and birds that live in them and that they will endeavour to impress upon them the importance to the country as a whole of the existence of forests and the protection of them and their inhabitants.

THE CHAIRMAN'S CONCLUDING REMARKS

In winding up the proceedings of the evening Mr. S. V. Ramamurthi, the Chairman said :—" I am sure we are all obliged to Mr. Wimbush for the interesting account he has given us of forests in South India. Mr. Wimbush has told us about the influence of forests on rainfall, on climate, on the conservation of water supply. Mr. Wimbush told us that in certain places in the north floods were more frequent because of wet cultivation as his friend thought, while he was himself of opinion that it was due to too much of cutting down of the forests. But I would suggest a third alternative and that is that most of the bunds constructed are not good and they ought to be improved.

I was interested to find in the report of the Joint Select Committee, paragraphs relating to the preserving and stimulating of forestry and irrigation in India. Much could be achieved by research in forestry. All these years our attention in regard to the application of science has first been to agriculture, then to horticulture and I believe we will soon turn our attention to sylviculture. By the application of science and due to intense research work, the cinchona cultivation which at one time was impossible in Russia, has been made possible. Vernalisation is one of the most important revolutions in agricultural science. It has been developed during the last 4 or 5 years and this vernalisation has been extensively applied to trees in Russia. Many things are being done in agriculture in the way of budding. In regard to forests we can apply the same improvements of budding also. With regard to forest utilisation, our woods in Madras are largely jungle woods. Our teak forests are comparatively small in area and the reason why our forests have not given large returns to the Indian investor is the unfortunate difference between the teak and other woods. Teak has a power of resistance against white ants and fungi which the jungle woods have not and as such the jungle woods are the " depressed classes " among the forest trees. But with the application of science, it has been

made possible to preserve jungle woods also against white ants and fungi. This improvement in forestry would open a large industry which would be a better panacea for unemployment than selling or hawking in the streets. I am sure that due to the emphasis which the Joint Select Committee has laid on research, in future greater attention would be paid in India to forest development. I hope for a research institution in Southern India like the one at Pusa and I look forward eagerly to such improvements and research in forest cultivation which would materially improve the national income.

Rao Bahadur R. Krishna Rao Bhonsle, then proposed a vote of thanks, and the meeting came to a close.

Geography and Education

[It is hoped that it will be possible in future to arrange for a special section in each issue of the journal dealing with problems of Geography teaching in the schools. Geography teachers are invited to send in accounts which they think would be of interest and value to other teachers, of how they themselves have successfully overcome difficulties in the teaching of the subject. These accounts may relate to any stage in the school course, and to work in elementary as well as in secondary schools; they may deal with such aspects as the presentation of new ideas, methods of learning, the organisation of work, the making of equipment etc. etc.]

NOTE.—Map reading in Fourth Form. The Association will be pleased to help teachers in the ordering of the local survey maps prescribed in the new S. S. L. C. scheme for Fourth Form. Teachers desiring information as to the index number of the one inch map of their locality should apply to the Secretary stating the following particulars *viz.*, name of locality, taluk and district.

GEOGRAPHY UNDER THE DALTON PLAN

By

HELEN T. SCUDDER, M.A.,

The following assignments were given to the Fourth Form and were completed in 9 weeks. Each block of work is planned for three weeks and must be completed at the end of the three weeks. The blocks are divided up into questions, simply as a matter of convenience for keeping track of the pupils' progress.

The time allowed for Geography, including both the school hours and the time for home work, is 2½ hours a week. Of this, one period of 40 minutes is a regular teaching period.

The study of Australia was planned around certain problems which the pupils discussed and then set out, to solve with the assistance and direction of the questions. The following were the major problems which were taken:—

Problem I. What are the reasons why the population of Australia is distributed so unevenly? (In the solution of this

problem a study of relief, rivers, climate and minerals was undertaken).

Problem II. How do the people of Australia earn their living? How do they provide themselves with food and clothes and houses, fuel, luxuries and tools ? (In the solution of this problem, the topics, occupations, trade, communications and towns were studied.)

The individual work of the assignments, and the class teaching are very carefully correlated. The class work falls roughly into the following types of lessons :—(1) Introductory lessons, to rouse interest. (2) Lessons consisting of pupils' reports on the extra or optional work provided. (3) Lessons summarising the work of a block. (4) Lessons dealing with any particular questions which many pupils in the class have found difficult. There were 9 teaching periods in connection with these three blocks. The first period was used to introduce the general topic and to rouse the interest of the pupils, mainly through talking about the discovery and early exploration of Australia. By the second period most children had completed the first three questions, and had done the extra reading suggested. So the second class period was taken up with reports on the "wonders of Australia" given by several pupils. In the third class period certain difficulties which had occurred very frequently in the pupils' work (which was of course carefully corrected each week) were dealt with. Such things as the relief of Australia and the fact that the densest population is *not* found in the plains were drilled on. The fourth and fifth lessons were really a summary of the conclusions which the pupils had come to in their work on the assignments, in regard to the main controls of the population of Australia. By this time the first two blocks of work, i.e. the first 27 questions, had been finished. The 6th lesson was again a time for individual reports on extra work. Such topics as the gold rush, the white Australia policy were spoken about. Then in this lesson also, the next block of work was introduced by discussing the list suggested in question 26. The next two lessons were of the type which dealt with pupils' difficulties, and gave drill on important facts—while the last lesson was a definite teaching lesson on Australia's communications and trade with the rest of the world, intended to answer the last question of the assignment.

Each pupil owns an atlas and a copy of Secondary School Geography by Dudley Stamp. They borrow Pickles—India, World

and Empire, from the pupils of another class, who use that as their main text book and who in turn borrow the Fourth Form's copies of Stamp. Archer's Stories of Exploration and Discovery is in the school library and furnished material for some extra reading. The Australian Annual was a source of interesting pictures, and for the most advanced pupils, Herbertson's Descriptive Geography of Australia was used.

BLOCK I. (3 WEEKS.)

AUSTRALIA

We know that Australia was discovered very recently. Last month you found out why this was so. Now we are going to study about the brave men who found Australia and what they found there.

Read Stamp pp. 20-22. Pickles p. 7.

Study the wall map of Australia and the picture, which is in your class room especially the lower left corner.

1. Write the names of the early explorers and discoverers, and the dates of their voyages. Tasman: Dampier: Cook.

2. Draw a map of Australia showing these men's voyages. Put in the names of the places where they landed.

When they arrived they found that Australia was a very different country from their own. *Read*: Stamp pp. 13, 14 and 19. Pickles pp. 6 and 7.

3. What did they find? Make a list of the trees, animals and birds which were there.

*Will someone read a special book that I shall give you and tell the class about some more "Wonders of Australia"? (Reference—Herbertson.)

The people too were very odd. *Read* stamp p. 21.

4. Write a brief description of the aborigines of Australia.

THE SETTLEMENT OF AUSTRALIA

Read Stamp pp. 22 and 25.

Study the map of population.

5. Who were the first settlers? Where did they live? What people live in Australia now?

6. Draw a map showing the population of Australia. You will find this in Stamp Fig. 20,

Under your map write

The thickest population is in the ——— ——— and ————

There is one small patch of country which is thickly populated in the ————.

Now we have another problem to think about. We have seen where the people live. We shall next try to find out why they live in just those places and how they live.

PROBLEM I. To find the reasons why the population of Australia is distributed so unevenly.

Study your atlas p. 11 where you will find a diagram of population and areas.

Read Stamp p. 318, p. 2.

7. How many people live in Australia ? How many in India ? How many people are there on the average to each sq. ml. in Australia ?

Compare the size of India and Australia and their populations.

Study the map of India showing population in Stamp p. 319

8. Where do the greatest number of people live in India ?

9. Why do you think they live there ?

Let us look at the relief of Australia to see if it will help to explain the distribution of the people.

Read stamp pp. 2-7.

Study the wall map and your Atlas maps of the relief of Australia.

10. Draw a map of Australia to show the mountains and plains. Locate all the mountains etc. named in Stamp and label your map very neatly (I shall ask you in class to *describe* the relief of Australia).

11. What are the three main physical regions of Australia ?

12. Does the relief help you to understand why most of the people live in the east ?

RIVERS.

Think again of the population of India.

13. Is there any connection between the distribution of population of India and the rivers ?

14. Draw on your map the chief river system of Australia and name it.

Look again at the population map you have drawn and the rivers.

15. Is there any connection between the population of Australia and the rivers ?

* The exploration of the mountains and rivers is a very interesting story. Will someone read about it and tell the class about it ? I shall give you the books. (Reference—Archer).

We have not yet found a satisfactory explanation of the distribution of the population of Australia. Neither relief nor rivers seem to give us reasons why the people live where they do. (Revise your map so that you know where they do live). Let us look at another set of possible reasons. That is, temperature and rainfall, or the CLIMATE.

Read Stamp pp. 7-10.

16. How does climate affect the distribution of population ?

17. What is the hottest part of Australia ? Why ? How hot is Darwin in summer ? in winter ?

18. Draw the two maps (Figs. 7 and 8) side by side. Colour the place where the temperature in Jan. is over 80 degrees RED. Colour the place where the temperature in July is over 60 degrees PINK.

19. Now look at your population map. Write a sentence about the population of Australia and the temperature. Think of the people of Australia and try to give a reason for your answer.

* Special reading and report on the " White Australia " policy.

20. Study the rainfall map Figs. 9 and 7 and answer the following questions. What kind of rainfall do you find in the *north* of Australia ? When does it come ? Why ? What kind of rainfall do you find in *South* Australia ? When does it come ? Why ? In South-eastern Australia ? In North-eastern Australia ? In Western Australia ? In Central Australia ?

21. Look at Figs. 9 and 14 and draw a map showing where there is more than 40″ of rain in the year, 20-40″, 10-20″, less than 10″. Look at Fig. 207 and notice what parts of India have over 40″ of rain. Colour the SUMMER rains blue and the WINTER rains mauve or brown.

22. Now write a sentence about rainfall and population.

23. There is a small patch of fairly thick population which still cannot be explained. *Read* Stamp pp. 30 and 31. (The region

near Kalgoorlie is referred to.) Describe the relief, rivers, temperature and rainfall of this region. Why is it thickly populated ?

* Describe the " gold-rush " and the life in these settlements. (Ref. Herbertson.)

24. In what other places are minerals found ? Make a list of these regions and the minerals and then draw a *picture* map to show the location.

The reason why climate is so important to us is of course mainly because the things which grow in a country depend so much on climate. So, in thinking about the people of Australia and where and how they live, we must know about the *vegetation.* Remember the rainfall and temperature all the time you are studying the vegetation.

Read Stamp, pp. 12-18. Pickles, pp. 5, 6, 12.

Study the wall map of vegetation.

25. Draw a map of the natural vegetation of Australia using the wall map. Make a large map and use colours for the different kinds of vegetation. Then write on the map very neatly, the *crops* which are grown in the different regions.

26. Make a list of all the things which *you* use which can be found in Australia. Make another list of things which you use which we have not yet found in Australia. Don't include anything on your first list which is not on your two maps drawn for questions 24 and 25.

27. The greatest occupation of all we have not yet mentioned. *Read* Stamp, pp. 25-31. What is this great occupation ? Write down a list of all the things you can think of for which sheep are useful.

BOOK III (3 Weeks).

The next problem (Problem II) which we must study, is how the people of Australia live. That is, we want to find out how they get food, clothes, shelter, fuel, luxuries and tools. There are 3 parts to this problem.

A. What do they produce for themselves and how much of it ?

B. What happens to the extra amount that is left over ?

C. Do they need anything else and if so, where do they get it from ?

Then we must also discover how they send things away and how they get things from elsewhere. Do you see that the answers

to these questions can be arranged under the following headings: *Occupations, Trade, Communications, Towns.*

A. What do they produce for themselves ?

Read Stamp, pp. 25-31. Pickles, pp. 11-14. Stamp, pp. 10, 12, 13.

28. Make a list of the 7 main occupations of the people.

29. Write a composition as if you were one of the workers of Australia (that is, imagine that you are a farmer or a shepherd, etc.). The best will be read in class.

30. Draw the maps showing where sheep, wheat, cattle, and dairy cattle are found. (N.B. No maps are to be traced this time.) Under the proper map write the following, filling in the blanks.

(1) Sheep are raised in ——, ——, ——, ——, (Names of states). Most of the sheep are found in the —— side of the hills in the —— because —— (Give 4 reasons).

(2) Cattle are raised in ——, ——, ——, ——, ——, ——. Very few are found in ——. The cattle live south of the regions where sheep live because ——.

(3) Wheat is grown in ——, ——, ——. It is —— of the Tropic, because ——.

(4) Dairy cattle are raised in the —— because ——.

31. Draw a map and put on it the fruits of Australia. Find out from Pickles where the different kinds of fruit are found and draw a picture map.

B. & C. Do the people produce more than they need ? Do they produce everything that they need ? There are very few places in the world where this happens, so we have the extra things sent away and other things which they want bought from other countries. This is trade. Now try to find out about the trade of Australia.

Read Stamp, pp. 41-44.

32. How many sheep are there in Australia ? List the *exports* which are sheep products. What proportion are they of the total ?

33. List the wheat products which are exported. What proportion of the total are they ?

34. List the cattle products: the mineral products: which are exported.

35. Draw the diagram Fig. 34.

36. Where are these things sent ? Wool, wheat, sugar. How much is sent to each country ?

37. What are the extra things which the people of Australia need ? What are the *kinds* of things imported ?

38. Copy the diagram and say what you think the people use each thing for.

D. We must now find out how these goods are brought to and taken from Australia. Think of all the means of transportation that you know of and all the types of communication also. Remember that Australia is a great modern country when you are imagining their means of transportation and communication.

GEOGRAPHY SCHEME OF WORK IN FORMS I TO III

The aim of the following scheme of work is to give an adequate idea of the requirements considered esssential, without restricting the school or the teacher too rigidly to any standardised method of planning the detailed syllabuses. In planning its Geography teaching syllabuses each school must select the treatment and material which is best suited to its own particular needs and resources, and in particular to the district in which the school is situated. The scheme merely outlines the general principles which must be born in mind.

1. The whole world should be studied in the 3 years. All the continents should be taken in turn and studied regionally. The treatment should be largely descriptive at the beginning and become progressively less so as the course proceeds ; it should aim at bringing out the influence of geographical environment upon human activities. Physical, human and political geography should be taken in combination so as to present a synthetic picture of a human society in any area. Under no circumstances should these aspects be considered separately.

2. Emphasis should be laid on developing a broad general knowledge of world topography including the main physical and political features.

3. The following geographical principles should be treated in an elementary way in relation with each in connection with the region of which it is characteristic :—

Formation of fold mountains, block mountains and rift valleys ; volcanoes, hot springs and geysers, the Pacific "Girdle

of Fire"; earthquakes; the work of rivers as illustrated on a large scale by characteristic types, *e.g.,* Ganges and Colorado, and as seen by actual observation of the local streams; underground water and ordinary wells and artesian bores; tides and their work, a tidal bore; the snow-line, avalanches, glacier and iceberg; formation of soil. Simple climatic studies—the effect of elevation and latitude upon temperature, why rain falls, how winds bring rain, trade winds and monsoon winds, the effect of the sun's altitude upon temperature, the seasons in temperate lands and tropical lands, the effect of temperature and rainfall upon vegetation and the resemblance between the sequence of zones of vegetation found from the Equator to the Poles and that found on the slopes of mountains, leading up to the study of simple temperature and rainfall distribution over a continent, and of simple regional distribution over a continent.

4. The following geographical concepts should be gradually developed in the mind of the pupil in the course of the regional study and not as separate lessons:—

(*a*) A clear picture of the work and environment as found in a characteristic region of the following workers:—hunters and trappers, lumber men, deep-sea fishermen, farmers including the wheat farmer, rice-farmer, millet-farmer, dairy farmer, fruit farmer, sheep farmer.

(*b*) A clear picture and life of environment as found in the following regions:—a desert region, an oasis, a tropical forested country, a mountainous region.

(*c*) Clear ideas of typical products grown in different climatic regions—what they are like, why they are important, why grown in particular regions.

(*d*) Sound elementary ideas of the following:—how coal is used; the use of water-falls to industry; how metals are produced; important uses of iron and wood; the dependence of factories upon communications and population; the purpose of locks in ship canals; characteristic ways of irrigating lands; geographical factors that have helped settlements to develop; how man has reclaimed land from the sea; why and

5

how men exchange goods; ways in which people and goods are transported.

5. *Map Work.* The pupils should be gradually introduced to the idea of the contour line in the representation of relief, of simple climatic maps (temperature, wind and rainfall) of vegetation and population maps. They should also be given practice in the making of sketch maps from given data. Attention should also be drawn to the value of lines of latitude and longitude as a means of indicating world position and of calculating distances.

6. *Sun and Weather Observations.* The following daily observations should be taken for a season at least and the records plotted in graphic form on a large scale, if necessary—maximum and minimum temperatures and the rain gauge. The altitude of the sun should be taken by means of shadows once a month, and the relationship between sun altitude and the seasons emphasized and dates of overhead sun to be observed.

7. *The Home Region.*

8. *Globe Study.* Exercises based on the slate globe to demonstrate how the spinning earth is the cause of night and how the shadows move, cast by a pin on a rotating globe, and their resemblance to the shadows cast by the shadow pole in the play ground; the effect upon length of day and night when the spinning globe is moved round the source of light; how places are located on the globe with reference to 2 meridians.

9. *Regional Geography.* A suggested treatment would be —Form I.—The three southern continents. Form II.—North America and Asia. Form III.—Europe and the British Isles.

SPECIAL REGION FOR C. GROUP GEOGRAPHY 1935.

Suggestions for the study of North America east of the Prairies.

I. A general study of the region as a whole to bring out its unity and the differences between it and the rest of the continent, including.

(*a*) Relief—the Appalachian system in the North and South, the differences and the causes of these differences, emphasising especially glaciation.

The coastline in the North and South (as above).

The coastal plain in the North and South (as above).

(*b*) Climate and causes.

(*c*) The history of the settlement of this region and the influence of the historical factor on the present occupations and distribution of population.

II. A detailed study of the following sub-divisions, including in the case of each, the relief, climate and development, but with special emphasis on the points noted below as the outstanding features of the region.

1. The Northern Appalachian Regions.

(*a*) Newfoundland—fishing and other industries; their development and the reasons for this.

(*b*) The Maritime Provinces of Canada—agriculture and fruit-farming; forestry; mining.

(*c*) The New England States—manufacturing and its historical development; types of manufacture and the reasons for the localizations of these industries; cities; the specialized agricultural development.

2. The Southern Appalachian regions i.e., south of the Hudson.

(*a*) Coastal plains and agriculture.

(*b*) the Fall line and routes to the interior.

(*c*) The Piedmont plateau.

(*d*) Ridges and valleys of the Alleghanies; Coal and manufacturing.

(*e*) Cities of this region with special emphasis on New York.

3. The St. Lawrence lowlands.

(*a*) Lake Peninsula, its special climatic condition and fruit farming.

(*b*) the lower St. Lawrence basin—lumbering and agriculture; cities and their location and development.

4. The Great Lakes—formation; the improvements in the natural waterway (Soo canals, Welland canal) trade on the lakes (wheat, coal, iron).

Lake cities and their growth, and the factors in their development.

5. The South-eastern Plantation Region: Cotton and other crops.

6. Florida—its specialized development.

The Ramayana

AS A GUIDE TO THE GEOGRAPHY OF INDIA

By

Diwan Bahadur K. S. Ramaswami Sastri.

Some scholars regard the Ramayana as typifying the Aryan conquest of South India. The Aryans themselves are regarded as immigrants into India from abroad. Some savants say that the Pandyas were so-called as they claimed descent from the Pandavas. Some speak about a deluge that washed away a portion at the southern extremity of India. These and other unproved theories are puzzling to a degree. It is worth while to examine them afresh and to see what light is thrown by the Ramayana on the geography of India.

The Vedas do not refer to the Aryans as having come into India from anywhere else. They refer to the Himalayas as the northernmost range of mountains (*Uttaram Girim*). The theory that Sita is the furrow of the plough and that her abduction signifies the extension of Aryan agriculture into South India is sheer fancy. Her going back to Ayodhya must then mean the disappearance of agriculture from South India. Further, the Ramayana describes the Rakshasas as reciters of the Veda, and Ravana is described as a Brahman (Brahma-Rakshas). It is impossible to regard him as a non-aryan or to say that Rama's conquest over Ravana typifies the penetration of Aryan culture into South India. The Ramayana refers to the Chera and Chola and Pandya kingdoms, and hence the Pandya Kings could not have been the descendants of the Pandavas.

Ayodhya was the famous capital of the Kingdom of Kosala. It was known as Saketa. It was on the banks of the Sarayu river. It was situated between the Ganga and the Yamuna. We learn in the Ramayana about the Kingdom of Anga which was ruled by Lomapāda who adopted Dasaratha's daughter Santhā, the kingdom of Kekaya in Northern Punjab of which the capital was Girivraja and which was ruled over by Kaikeyi's father Asvapathi, the kingdom of Mithila which was governed by Sita's father Janaka, the kingdom of Kasi, the kingdom of Magadha, the kingdom of

Sauvira, the kingdom of Saurastra, the kingdom of Sindu, the kingdom of *Vanga* (Bengal), etc. We find detailed descriptions of Kishkindha and Lanka. We find references also to the Kekaya kingdom, which was ruled by Kārtaviryarjuna. The Ramayana says that Satrughna killed Lavanasura and established the town of Mathura (Muttra) on the banks of the Jumna.

In the description of Rama's journey from Ayodhya to Lanka we find a clear description of the geography of Middle India and of South India. Rama lived for a while on the Chitra Kuta Hill and for ten years in the Dandaka forest. Janasthana was ruled by Ravana's vassals as an outpost.

Sugriva's description to the Vānaras in regard to the search to be made by the search parties gives us valuable details about Indian geography. We hear in it about the Kaveri and the Tāmraparni rivers. In short the Ramayana shows and gives us a clear knowledge of the geography of India

Extracts from Periodicals

SCHOOL EXAMINATIONS SURVEYED—GEOGRAPHY

By

Mr. C. B. Thurston.

As an examination subject, the position of Geography is rather unique. Of the eight examining bodies conducting examinations at the School Certificate stage, four place Geography in both of Groups I and III, three others place it in Group I only, and the remaining body regard it as Group III subject. This is a reflex of the difficulty that Geography has had till quite recent times in securing recognition as an important subject in the Secondary school course. Most of those concerned with the conduct, inspection, and examination of schools, having themselves been trained in either the arts or the science side of the University, seem to have regarded as an interloper, a subject which has obvious links with both and yet which could not clearly be identified with either. So Geography has had few friends at Court. It is, however, this double-sided character of the subject which gives it its great, if not unique, educative value in the school curriculum, and is slowly but surely gaining for it the position that it deserves. After long centuries of neglect, the " Mother of the Sciences " is coming once more into her own. The many branches of knowledge, scientific and human into which the single world study of the Greeks has since become divided are once again being brought together by Geography to give a unified outlook upon the world and its peoples.

Its popularity as a school subject is shown by the fact that, although it is still poorly provided for in the matter of University scholarships, about three-quarters of all the candidates taking the school certificate examination offer Geography as one of their optional subjects. This too, in spite of the fact that according to the Report of the Investigators, there is " a tendency to look for more detailed knowledge in Geography than can reasonably be expected of candinates of 16 who are being examined on a wide syllabus," and also " a more exacting standard of distinction is required in Geography in most of the examinations."

The more important aims that a modern teacher of Geography has in view may be summarised as follows:—

(a) To train pupils to observe and record accurately in their home region the factors of physical and climatic environment and their influence upon human activities thus teaching them to avoid hasty and prejudiced generalizations based on insufficient data, and enabling them to understand other regions at home and abroad, studied with the help of books, maps, pictures, and statistics.

(b) To encourage a sympathetic understanding of the lives of people in other regions as influenced by their differing environments.

(c) To build up a knowledge of the inter-dependence of peoples in all parts of the world.

(d) To show how Geographical factors have influenced human development in the past, and in what ways they may be expected to continue to influence it.

It will be fairly obvious that, however successful teaching along these lines may be, much of the resulting product will not come within the possibility of ordinary mass examination. That is scarcely the fault of this subject, and Geography is certainly none the worse for that. At the school certificate stage, most of the examination material of the usual type will have to be based upon work done by the candidates in pursuing the first aim set forth in the preceding paragraph. Probably, success or failure in the wider or more definitely cultural aims cannot be judged at all by examination as generally understood; and it is therefore desirable that the examination in Geography should not make such demands as to involve sacrificing them in order to concentrate entirely upon teaching which may produce visible results. Geography seems to present a very definite case for the attitude taken up by Sir Philip Hartog in the introductory article of this series, when he says: "I would strictly limit the field of school examinations in such a way that a considerable part of school time is entirely free from their influence, and I would trust the teachers to use that time in the best way possible."

Now as to the examinable portion of our school Geography Course; what might a candidate reasonably be expected to know and to do after a five years' course at a Secondary School?

There is a fairly general agreement that one question out of the six or seven usually asked to be done, should be based upon an ordnance map. Some examining bodies make this question compulsory but having regard to the difficulties presented to some candidates in actually deciphering the rather indistinct symbols, words, and figures upon some sheets of these maps, it is doubtful whether such a course is fully justified. In any case, it is of first importance that examiners should select sheets where the test will not be unduly trying to the eyesight, and the questions upon it should be upon points which would interest any intelligent user of the sheet; such as distances, routes, gradients, scenery, and view-points. Section drawing may be a useful teaching device, but is not suited to a school certificate examination in Geography.

Many teachers would like to see among the questions one dealing with the local region, upon the study of which the best real Geography teaching is based. The difficulty of setting such a question in a public examination for candidates from a wide area is almost insuperable. A question dealing with a whole country is not really a question in local Geography for any school in it; for anything like a complete study of such an area would take all the time allocated to Geography throughout the course; while the answer to a really "local" question could only be accurately assessed by an examiner who knows each locality very well. This is a point for those who consider that it would be more fitting for school certificates to be awarded by the school authorities and not by an external examining body.

All Geography teachers are agreed that it is important that the whole world should be studied at least in outline. Otherwise, indeed, Geography would belie its name. It is probably in this section of the work that examination papers come in for most criticism. Owing to limitations of time and the special interests of different teachers, it is natural that in different schools various foreign countries come in for unequal treatment. If a candidate finds in the paper a question bearing on some country of which he has learned little, he and his teacher sometimes are apt to consider the question hard, while in another school the same question may be expressively hailed by the boy, if not by

his teacher, as "Jammy," because the subject matter of it has recently been discussed in class work. It is obviously impossible for the examiner to set questions dealing with all parts of the world, not only because of the inordinate length of the paper that this would entail, but because it would defeat its own end in tempting some teachers working under pressure to confine their teaching to very few regions, knowing that their candidates might then be relied upon to make a good showing on these in the examination. But until there is a much more general agreement among teachers as to the connotation of the phrase "the rest of the world in outline," it would be equally unfair to set only a few questions in this section of the paper and make them compulsory for all candidates. An examiner is therefore bound to cast his nets wide enough to give all candidates a reasonable chance, but not so wide as to enable a pass in Geography to be secured with a very limited knowledge of the world in general. Questions in this section should deal preferably with whole continents, and in any case not with a smaller unit than a whole country or region of comparable size.

If the examination is to be well balanced, some of these questions should continue to be of the "essay" type, such as call upon the candidate to marshal his facts and conclusions in clear logical language. The notorious difficulty of marking such answers should not be allowed to exclude this type of question from the examination, especially as this subject gives many opportunities for the questions of the short answer type. In the very interesting new style of examination paper devised by the largest examining body in the country, the essay type of question is reduced to a minimum. Candidates are not only given the "heads" under which to arrange their answers, but they are allotted for each paragraph a space which cannot be exceeded.

Although this will undoubtedly curtail the masses of irrelevant matter, which are the bane of the marker, it would seem likely to cramp the style of a good candidate and to make it difficult to test the power of selection and correlation of data which are among the best results of good geographical teaching. For example, candidates were given just ten lines in which to "Discuss the characteristic industrial activities of New England." One wonders what sort of discussion could be squeezed into so small a space.

The present writer is of opinion that in the "rest of the world" section, besides one or two essay type questions there should always be a compulsory question in which the candidates should be expected to indicate on an outline map of the world a large number of facts that could definitely be marked right or wrong (*e.g.*,) the position of certain oceans and seas, well known capes and bays, mountain ranges, rivers, lakes and islands, countries and cities of world interest or importance, important routes by land, sea, and air, latitudes and longitudes that should be well known, the main sources of supply of products of world importance, well defined climatic and vegetation regions, important ocean-currents, etc. It is obvious that such a question could be prepared for, but the preparation would be all to the good in correcting the "Wooliness" that sometimes results from too much descriptive work. And if, as might occasionally happen, a good candidate should secure full marks on such a question, so much the better. No one complains of this happening in mathematics.

The British Isles naturally receive the most detailed treatment in most school geography courses in this country, and at least one question from the section of the paper dealing with the home country is, and should be, compulsory in all examinations. As a rule, little complaint is heard of these questions. Occasionally, there is reason to believe that the examiner has not visualised the length of time that would be required to give an adequate answer to his question. When illustrative sketch maps are asked for, it often means that if the maps are to be at all well done more time than that allowed will inevitably be required even by candidates to whom such work comes easy. Ability to draw sketch maps is also not always an index of geographical ability. In existing circumstances many examination sketch maps are examples of gaudy irrelevancy, rather than of the simple neatness and accuracy that should characterise this work if it is to be of any value. The practice of providing outlines for some of the sketch maps required from the candidates, as is done in the new style paper referred to above, seems to be commendable.

As extensive travel, which is, of course, the best method of studying Geography, is at present impossible in School Geography Courses, great use is made of various pictorial aids in the teaching of the subject. It is therefore becoming increasingly

common in examinations to test the candidates' ability to gather accurate impressions from pictures. This seems to be excellent, provided the pictures are all well chosen and clearly reproduced. In a recent examination, candidates were asked, among other things to deduce the nature of the surface rock of the district shown in a photograph and also the season of the year in which the photograph was taken. As a large body of teachers and examiners, after study of the picture, were far from unanimous on these points, it would scarcely be surprising if numbers of quite satisfactory candidates were unlucky in their guesses.

Much good geographical teaching is based upon the study of various statistics, especially such as relate to climate, population, production, and commerce. Questions to test this work are fairly easy to set, and the answers relatively easy to assess. It is usual to give a set of figures, and to ask the candidate to make suitable deductions, but sometimes the candidate is expected to know the figures as well. In the latter case, only very widely known statistics should be asked for, or otherwise a good candidate might be debarred from showing that he is quite able to draw accurate conclusions from given data. The drawing of graphs or maps from statistics, although useful as a teaching exercise, is scarcely suitable for a question in a general examination.

(From the "Journal of Education.")

CITIZENSHIP THROUGH GEOGRAPHY

By

Mr. W. O. Lester Smith,

Director of Education, Manchester.

WHAT BRITAIN IS DOING

In one of his "Fallodon Papers," the late Lord Grey discusses Representative Government and observes that of all forms of polity, our own is the best from the individual's standpoint because it cherishes the "asset of personal liberty" more than any other. He then proceeds to consider how our own democracy, as the best of its type, can be "strengthened and improved," and he concludes that its essential need is education of a kind that will create a sound public opinion. Here I propose to indicate in what way geographical teaching to-day is helping to prepare the mind of the younger

generation for the kind of world in which it will live and vote; and as space is limited, I will confine myself to what it is doing to shape public opinion about foreign affairs. What, for example, is it doing about the League of Nations? About two years ago, the Board of Education prepared a report upon "The Instruction of the Young in the Aims and Achievements of the League of Nations."

"The approach," the Preface states, "to the teaching of a subject like that of the aims and achievements of the League is necessarily cautious. Direct or dogmatic methods might arouse the opposition of the parent, and in some cases the resistance of the pupil who, in this country, is reserved about giving any outward expression to his convictions."

The Report itself reveals that, with characteristic diversity of method, there is a large volume of education upon the aims and achievements of the League of Nations in the schools and everyone familiar with English education will agree that both in and out of school hours, on corporate occasions and by individual study, the schools in making known the work of the League are doing a great work for international goodwill. Undoubtedly, the most effective work is that done naturally in the class-rooms, for when "League Instruction," as it has been termed, falls within the curriculum as part of the normal syllabus, children appreciate in a way not otherwise possible that the League of Nations is not some abnormal excrescence, but an integral part of our system of government. I do not intend to suggest that it is not a suitable subject for the school on corporate occasions, but rather to stress the view that it is no less for that reason the concern of the normal curriculum. The abnormalities of school life tend to produce reactions, and, like Christmas pudding and simnel cakes, can be indigestible. The progress of the study of world citizenship depends largely upon how far teachers succeed in finding it a place in their syllabuses and upon what that place is. Since opinion appears to be strongly against its inclusion as a separate subject, the question resolves itself into its incorporation into existing subjects of the curriculum, or, more correctly, the assumption by one or more of those subjects of an international bias.

POLITICAL AND CULTURAL SIDE OF GEOGRAPHY

The growing tendency of the geographer at the present time to introduce this bias is one of the most hopeful signs that has yet

appeared of a satisfactory method of forming an internationally minded citizenship. The tendency is natural and unforced. The teaching is not extra to the curriculum; nor does it rely for its creation of international outlook upon pamphlets, occasional talks in the assembly hall, or an exceptional share of the school notice board. It is a movement of the class-room and is an unrestrained evolution of geographical method. In a paper written last year by Mr. Donald Gray on the teaching of geography, he puts the position as follows:

Hitherto geography has tended to stop after physical and economic questions have been dealt with. Only very recently has the political and cultural side begun to receive adequate treatment under such teachers as Professor Fleure of Manchester. The interdependence of nations in trade is obvious, but respect for our neighbours will be assured by recounting their contributions to civilisation as well as to trade of the world.

The movement is strong in many elementary and secondary schools, and, where it flourishes, the geography room is not only a hive of intellectual activity but also a miniature Chatham House in which information about world affairs, pictorial, statistical and literary, is carefully docketed and readily obtainable.

Outside the class-room, the most valuable ally of the geography teacher is undoubtedly travel. As John Locke advocated the grand tour for the young ruling classes of his aristocratic age, so should we urge forward the well-prepared school journey and the interchange of teachers as essential parts of the educational system from which our young citizens derive their philosophy. At present, travel and interchanges are incidental, a sort of extra arranged only "by special requests," but it seems likely that they will become in time, a regular feature of everyone's education and of every teacher's training. It is encouraging to note that, in 1931, over 60,000 British children travelled under the auspices of the Scotland Journey Association, of whom 10,000 appear to have visited Europe or gone even further afield.

INTERNATIONAL RELATIONS AND THE SCHOOL CURRICULUM

A word may usefully be said as to the danger of introducing international relations as a separate subject in the schools. Enthu-

siasm may encourage some in that direction, but not if they reason it out. In the first place, let them remember that in the hands of any but a profound student of foreign affairs—a Wickham Steed or A. E. Zimmerin—it can become a most arid theme, a medley of petty detail about constitutions, assemblies and treaties. In like manner, it can relapse into the other extreme, an abstract study lacking that reality which children demand. On the other hand, there can be no question that, in efficient geography class-rooms, pupils are to-day receiving an education which gives them an insight into world problems almost as sure as the knowledge which pupils of an earlier generation had of Caesar's exploits. We may know more about the Gallic wars than they ever will, but they, in their turn, will not share our ignorance of Central and Eastern Europe, they will know why China and Japan are unfriendly, they will understand the implications of a White Australia, they will be alive to the significance of the Monroe Doctrine in the New World, and they will realise, as we do not, the mighty significance of an awakening Africa. Such knowledge must, at least, help to stimulate an intelligent public opinion in international affairs, and it should tend to give the nation balance in times of international stress. It is premature to speculate as to whether far-reaching consequences may evolve from it, but, if this new learning through geography should ever permeate the class-room of the world, civilisation will be much better equipped for that "last ascent" which Kant declared mankind could only hope to climb after "a long and intensive education of the spirit for all citizens in every country."

(From the "Education for Citizenship.")

PROPOSED EXTENSION OF THE MYSORE RAILWAYS

Shorter Route to South Indian Towns.

LINKING OF AGRICULTURAL AND COMMERCIAL CENTRES

The Government of India and the Mysore Government are considering a proposal to connect the Mysore Railway system with the South Indian Railway via Chamarajanagar and Satyamangalam, as stated by Dewan Bahadur N. N. Ayyangar, Chief Engineer of the Mysore Government, at the recent session of the Mysore Legislative Council. The projected line will be 56 miles long.

It is estimated that the total cost of the scheme will be ap-
ɔximately Rs. 2 crores. The section connecting Chamarajanagar d Satyamangalam has to pass through the ghats which separate ɜ Mysore plateau from the plains in the Madras Presidency to its ıth, and this accounts for the high cost estimated. But in spite the high cost of construction, the traffic survey made by the au-
ɔrities shows that the railway will be profitable and that return 6 per cent. on the capital outlay may be expected within five ars after the opening of the railway.

The outstanding features of the proposed railway, from the int of view of engineering, are:

There will be no less than 28 tunnels on the ghat section of 21 les between Chamarajanagar and Kottamangalam.

There will be a fall in gradient of 2,172 feet in 31 miles.

The total length of the tunnels will be nearly three miles.

The line will run through primeval forests in the *ghats* almost alling in richness and beauty the forests besides the ghat rail-
y in Travancore.

The establishment of direct connexion between the metre ıge of the South Indian Railway and the Mysore Railways has ɜn under consideration for over 30 years. Originally, it was ɔposed to extend the Mysore railway line so as to make a junc-
n with the South Indian Railway at Erode. This was before the ichinopoly-Erode section was converted from metre gauge into ɔad gauge.

A CONTINUOUS LINE

On the conversion of this section into broad gauge, however, ɜ original idea was abandoned and proposals were mooted to ınect the Mysore Railways with the South Indian Railway at ·uppur via Satyamangalam. This idea has been strengthened the proposal for construction of a metre gauge line connecting ıdigul, Palni, Pollachi, Tiruppur and Satyamangalam. When s connexion is completed it will provide a continuous metre ıge line between northern and southern India and from western lia through Mysore. The various projects have been surveyed difference times by the Mysore Railways and the South Indian ilway.

According to the present proposal, the existing Mysore-Chamarajanagar metre gauge line is to be extended to Satyamangalam in the Madras Presidency. The distance between Chamarajanagar and Satyamangalam by the proposed route is 56 miles, of which 11 miles will be within the Mysore territory and 45 miles in the Madras Presidency.

The Mysore section of the extension is estimated to cost Rs. 8.36 lakhs, while the British section will cost about Rs. 163 lakhs. The extension will also necessitate radical improvements to the existing line between Mysore and Chamarajanagar and these will cost an additional Rs. 8.5 lakhs. These estimates are exclusive of the rolling stock required for the construction.

The construction of the line will be an engineering achiev-ment, as there are various natural obstacles to be overcome. As the Mysore plateau is, on an average, 2,000 feet higher than the level of the plains below the ghats any line connecting the two areas has to negotiate a steep incline. The whole range of hills surrounding the Mysore District has been investigated for railway outlets at various times, and the alignment now proposed has been chosen as the best. In fact, it is stated that hardly any alternative is possible.

THE ROUTE

The alignment of the proposed link will be as follows: The line, after leaving Chamarajanagar station, will skirt round the eastern side of the town and run parallel to the Satyamangalam road for five miles, reaching the site of the Hardanahalli station. Thence it will cross the road and run south-west to Talavadi station, crossing the Mysore frontier at the 11th mile from Chamarajanagar. At the 27th mile the line will reach Talamalai, a station on the top of the ghat. Over this section of 27 miles, between Chamarajanagar and Talamalai, the line will take an up-gradient, rising 660 feet between the two points named.

The descent of the ghat will begin at Talamalai (2,958 feet above sea level). Between this point and Kottamangalam, on the plains below, a distance of 22 miles, the line will lose 2,100 feet in height and another 56 feet in the eight-mile run between Kottamangalam and Satyamangalam. It is the middle section of the line, which has a fall of about 100 feet per mile, that is estimated to cost

most. A ruling gradient of 1 in 45 will be adopted for this ghat section and there will be 28 tunnels, varying in length from 100 feet to 1,820 feet, their total length being 14,320 feet (nearly three miles).

The proposed connexion will bring the numerous towns and cities in South India and Mysore much closer, benefiting trade, commerce and intellectual and social intercourse.

For example, the distance between Mysore and Ootacamund by railway will be reduced from 398 to 153 miles. Similarly a great reduction will be effected in the railway distance between Mysore and other towns like Coimbatore, Erode, Tiruppur, Trichinipoly, Madura and Tuticorin, and the public will benefit by the reduced fares.

TRAFFIC SURVEY

Detailed surveys have been made of the commercial possibilities of the proposed extension and all reports on the subject contain the assurance that the new link will prove a commercial success and that the net return on the capital outlay will be about 4 per cent. in the first two or three years after completion of the line, increasing to about 6 per cent. after five years.

The extension of cultivation in the Cauveri valley and the rapid growth of sugarcane cultivation and sugar manufacture in the Irwin Canal area are arguments in favour of the railway extension. There is also the fact that the cotton areas in the Coimbatore District will be brought much nearer to Mysore with its cheap electric power. Without any expansion of the existing agricultural and industrial activities in the State the proposed link will more than pay its way, considering the traffic now available. And the advantages are greater when the extension of trade and commerce, following the opening of the line, is taken into account.

Promising forecasts of the passenger traffic have been made on account of the fact that such well-known places of pilgrimage as Rameswaram, Palni, Madura, Kumbakonam and Srirangam will be brought much nearer to Mysore by the proposed link.

Among the seaports which will benefit by the proposed connexion are, of course Tuticorin and Cochin. Traffic to Cochin will have a break of guage at Tiruppur, but there will be an unbroken

metre gauge connexion between Tuticorin and Mysore. From Mysore there will be a break of guage both to Madras and to Cochin, but Cochin will be nearer than Madras.

Thus the shortening of the distance beween many places in South India and Mysore, the stimulus to trade and commerce between such centres the avoidance of the inconvenience which traffic between such centres is experiencing now, and the fact that there will be an unbroken metre gauge connexion between north and south India through Mysore (from Poona to Tuticorin) are the principal arguments in favour of the proposed metre gauge link between Chamarajanagar and Satyamangalam.

A MADRAS PROPOSAL

It would appear that the Government of Madras have called for an estimate for the construction of a light broad gauge line from Kottamangalam to Tiruppur via Satyamangalam. But the construction of such a line would deprive the country of the continuity of a metre gauge long distance connexion between Poona and Tuticorin—a single gauge continuity which will prove advantageous also from a strategic point of view, should necessity arise. The object of the proposed light broad gauge line is not so apparent, while its disadvantages, viewed in the light of the proposed extension of the Chamarajanagar line to Satyamangalam, are obvious. On these grounds, therefore, the Government of Mysore have, I understand, protested against the proposed guage for the Kottamangalam-Tiruppur railway and pointing out the desirability of having a metre gauge line over this section. It is hoped that the question will be considered from the wider point of view presented by the Government of Mysore and that a continuous metre gauge connexion between north and south India, through Mysore will be made possible.

EXTENSION TO KOLLEGAL.

Allied with the proposed connexion between Chamarajanagar and Satyamangalam, there is a proposal for the construction of a branch line between Chamarajanagar and Kollegal, which is situated in Gobichettipalayam taluq, Coimbatore District. The distance of this line is about 22 miles and the scheme is estimated to cost about Rs. 15.75 lakhs. The Government of Mysore have been permitted to construct and work the entire length of this line, the last four miles of which will run in the Madras Presidency.

—*"The Madras Mail."*

Excursions

THE MICHAELMAS TOUR OF THE MADRAS GEOGRAPHICAL ASSOCIATION

Thousand Miles by Bus

By

T. B. Ranganatha Davey, B.A.,

Under the auspices of the Association a ten day's geographical tour by bus was organised and conducted during the Michaelmas Holidays (19th to 18th September) by Messrs. N. Subrahmanyam (of the Teachers' College) and George Kuriyan (of the University Geography Department)—the places visited being Oorgaum (K. G. F.). Bangalore, Sivasamudram Falls, Mysore, Kannambadi Dam, Seringapatam, Pykara, Ootacamund, Coimbatore and Mettur. The party, which included three ladies, consisted of students of Geography from the Teachers' College University Geography Department and the Lady Willingdom Training College.

At 2 p.m., on Wednesday the 19th September 1934 our party left the Teachers' College by Bus; and after about an hour's run reached the *shale beds* near Sriperumbudoor, about quarter of a mile away from the 27th mile 1st furlong. Here a half hour was spent in examining the shale beds that were exposed along one side of a water course. After splitting some of them to get at fossil imprints and taking a few specimens the party continued the journey. We reached Wallajah about sunset and Chittore at about 7 p.m. where we halted for the night.

Early next morning we started at about 4 a.m., and resumed our journey; but owing to the darkness, missed the splendid view of Mogali gorge. After daybreak, however, we could well appreciate the scenery of the Mysore Plateau which we had now entered and found the changed aspect of the country. By 7-30 a.m., we reached Robertsonpet. After an hour's preparation we were ready to accompany the Inspector of Mines who was deputed to take us round one of the best mines in the locality, namely, the Nandydoorg mine. Here we were first taken to see the workshop and then the different processes of gold extraction. From the

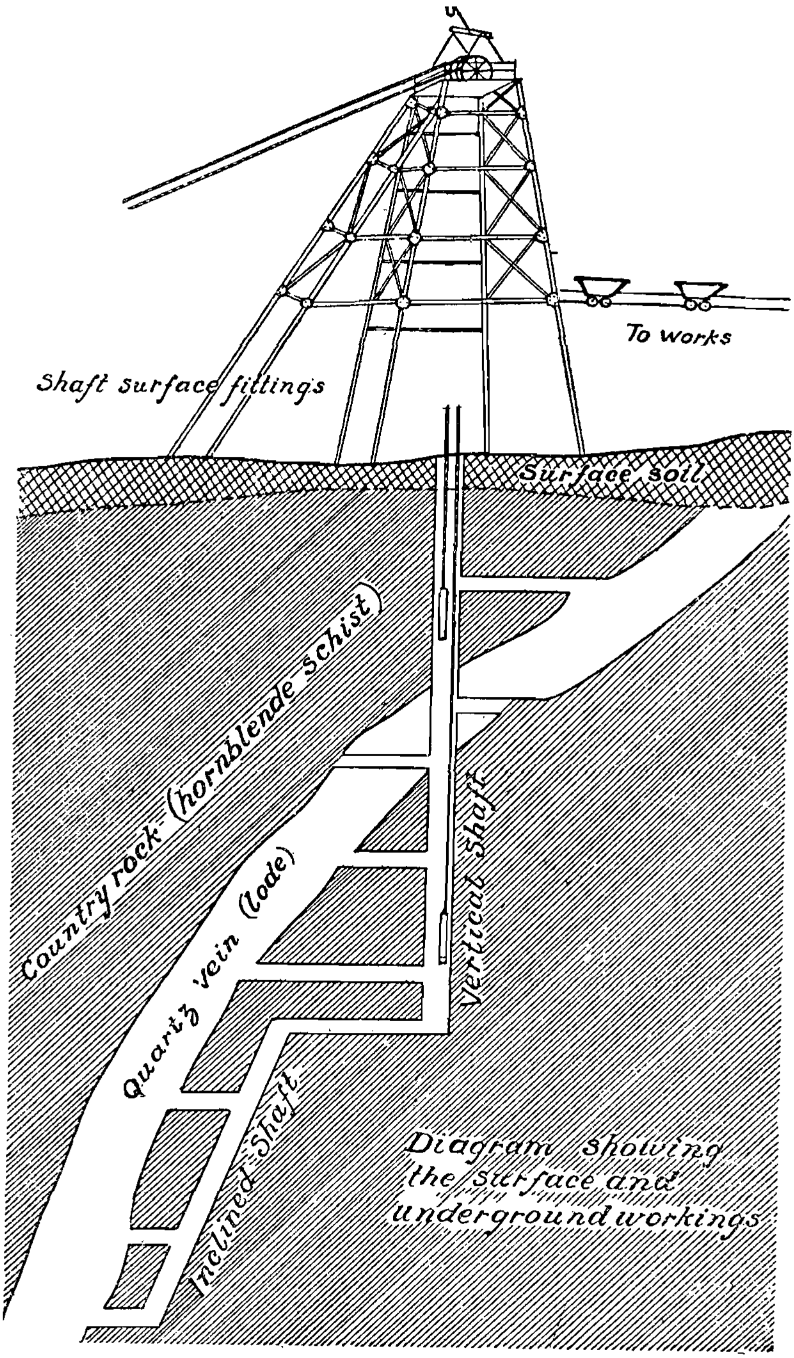

Fig. 6. Diagram showing the surface and underground workings in a gold mine.

stage of powdering and washing the quartz on through the various processes of separation of gold including the cyanide process to the final stage of smelting the ore in the crucible and making it into bricks.

We next had the thrill of being taken about 5000 ft. down the mine by means of an electric lift which did the whole of the descent in about 4 minutes. We walked through some of the corridors and were shown the quartz reefs *in situ*. The pit props put in position, the rails and the trolley, the pumps always at work and several other details impressed themselves very strongly upon our minds and thus we got a real idea of a gold mine.

After leaving the mine we took our midday food at Robertsonpet and drove *via* Kolar to Bangalore which we reached about 5 p.m. Greeted on our entry by gentle showers, we reached the Central College Hostel which was our lodging during our stay at Bangalore. At this stage I cannot but refer to the immense advantage of the bus journey over the train journey for educational touring parties such as ours. Not only could we enjoy the scenery right along the route, stopping wherever we wanted to, to examine a rock or a river bed, but we were also saved the nuisance and the expense of removing our heavy luggages at every stopping place incidental to a rail journey. Moreover there was no need to go in for any other conveyance when we had to visit places and institutions at Bangalore the next day, as well as at Mysore later on. In fact all our sight-seeing in all the big towns through which we passed was fairly complete as we could take the bus through every nook and corner.

On Friday the 21st September we went about visiting in Bangalore the Imperial and Agricultural Dairy Farm, the Imperial Survey of India Office, the Tata Research Institute, the Government Porcelain Factory, the Government Soap Factory, the Bull Temple at Basavangudi and the Lal Bagh, besides driving through the important parts of the City and the Cantonment. Out of these places, special mention has to be made of our visit to the Map Survey Office. Here the Assistant Director of Survey, Bangalore Circle took us round and explained with demonstrations the various stages in the preparation of the one inch O.S. map. One of the Junior Officers in this Office, Mr. Thomas, narrated to us in detail his thrilling experiences near Chitral in the North-West Frontier when he was there for six months on official duty, doing

triangulation work, illustrating the same with his album of Photos. All this interesting programme at Bangalore due to the care and fore-thought of Mr. G. K. Krishnamurthi, B.A., L.T., the Secretary of the local branch of our Association.

On the morning of Saturday the 22nd Sept. we left Bangalore after our *Chota* ; and after a couple of hours' drive reached the Government silk factory at Chennapatna where we spent a useful half hour learning about the attempts made here to improve the condition of one of the most important industries of the State, one which is practically a bye-industry for the peasant.

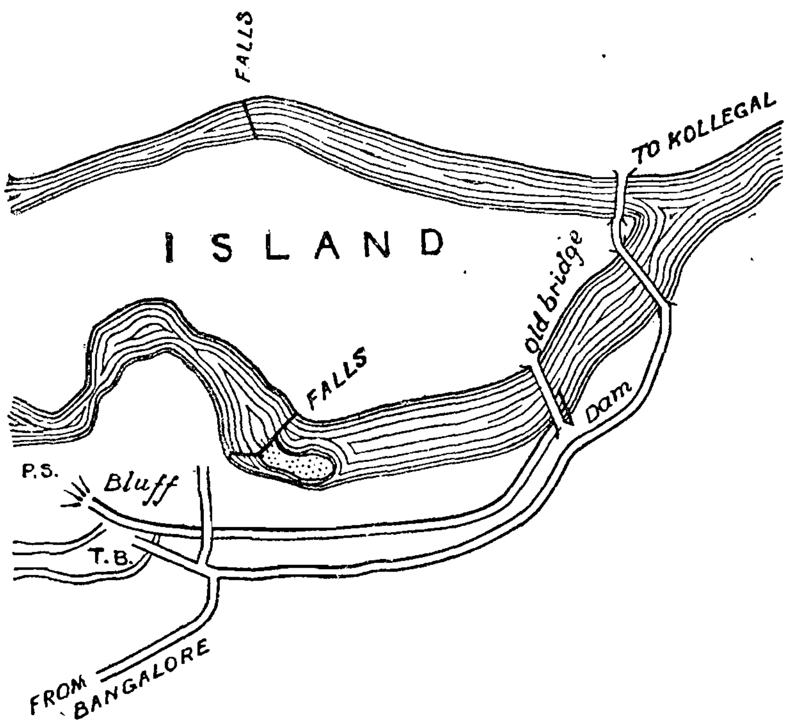

Fig. 7. The Island, the Bluff and the Falls.

Resuming our journey, we reached the Bluff at about midday, when without even caring for the hot sun we rushed down to the foot of the falls and feasted our eyes with the glorious spectacle of the falling watters. After refreshing ourselves at the Rest House, we went down by the trolley to the Power House, where we were shown the penstokes by which the water was led down from the re-

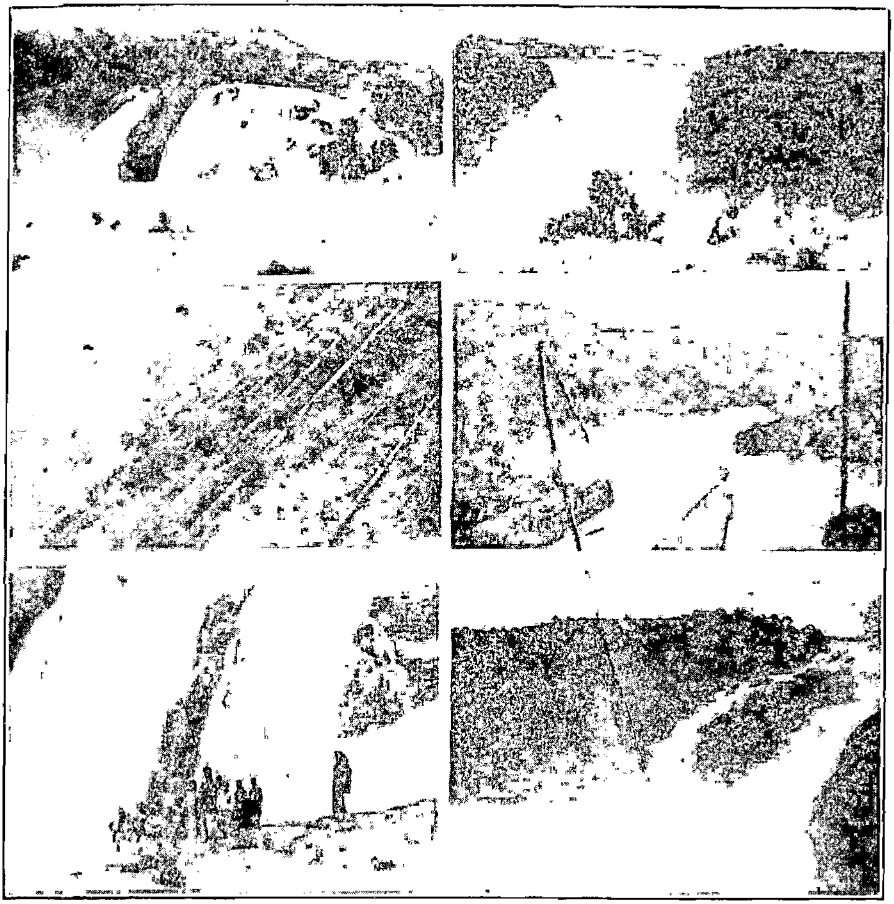

Fig. 8. The Falls, Penstokes and Power Station.

servior, the huge turbines and Dynamos and the stepping up of Power to high voltage before transmission etc.,—all of which gave us a real peep at how Electricity was produced from falling water. We saw the machinery run by this power at the Kolar Gold Fields, and we saw the electric insulators made at Bangalore from Kaolin brought from the neighbourhood ; and here we saw the production of the power itself. At Mysore, we saw the very same power transmuted into a panorama of light decorating Sri Chamundi hill and the fountains of Krishnaraja Sagara Works.

Leaving Sivasamudram in the afternoon, we arrived at Mysore about 8 p.m. Next morning we drove up Chamundi Hill in our Bus, while some of us for the mere fun of it climbed it by the

steps. From the hill-top we got for the first time a commanding view of all the country round for miles and miles together ; and it was a joy to trace the features which we actually saw around us on the one inch map which we took with us. The ribben of

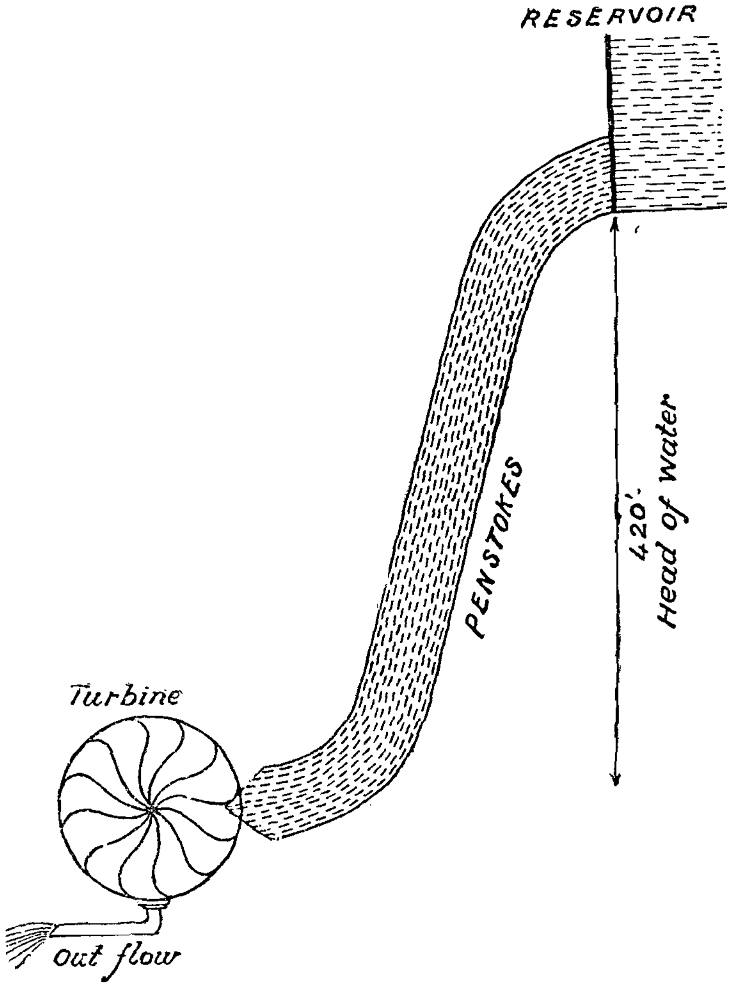

Fig. 9. Reservoir Penstokes and Turbine.

verdure along the river valley, the pattern of cultivated fields, the scanty vegetation of rising ground, the blue haze of the distant hills, the vast sheet of the Kannambadi Reservior, the bright minarets of Seringapatam mosque and several other land marks interested us immensely. Coming down from the hill, we visited the Zoo which was a much grander one than what we have in Madras.

That evening we visited Seringapatam and Krishnaraya Sagara works. At Seringapatam we had an opportunity of appreciating the greatness of Tippu Sultan from the remains of the fortifications, from his Summer Palace "Daria Dowlat", the Goli Gumbaz, De Haviland's arch etc. But the glorious sight of the illuminated fountains at the Krishnaraja Sagara works was something unique; and we had to tear ourselves from the place most unwillingly. We felt it was worth while to come all the way at least to see this alone.

At 10 a.m., on Monday the 24th September, we left Mysore for the Nilgiris. After leaving the Mysore Frontier beyond Gundlupet, our journey along the Moyar valley and through Gudalur forests was very interesting and enjoyable. But the joy and thrill was much greater indeed when we were making the continuous ascent from the lower plateau of Gudalur up the Nilgiris proper. The temperature was visibly changing, as it were, every minute. Though we got a peep at the Pykara lake and the Pykara slope we were too late to go down the trolley that evening, and so reached Oooty to have a welcome rest—snug and warm. Next morning we returned and went down the 11000 ft. incline by trolley and saw a replica of Sivasamudram here again, but with a sort of feeling that it was our own, that in some of our towns we have already got the power from here and that we would be getting it in others sooner or later. The lady members of our party, who were not permitted to go down the trolley, were compensated by boating in Pykara Lake—a beauty spot, quiet and serene.

Our lodging at Ooty was so very nice and comfortable and the weather was so very bracing that we were tempted to stay a day longer, contrary to our original programme; and we had to pay the penalty for it by cutting short most of our items at Coimbatore the next day. The journey across the Nilgiris was a unique experience for so many of us for whom this was the first visit. The night temperature of 68°F and 56°F tried the mettle of some of us. The vegetation and the scenery were unlike any that some of us had seen before.

On the morning of Wednesday the 26th Sept. we left Ooty after *Chota* about 7 a.m., and drove down the Hills through Coonoor valley where the scenery was most gorgeous. When we reached Coimbatore at midday we were feasted with a sumptuous dinner by Mr. Rao Saheb C. M. Ramachandra Chettiar, the President of the Coimbatore branch of the Association and by Mr. T. S. Krishnamoorthi Ayyar, District Educational Officer, Madras.

Leaving Coimbatore after dinner at about 2 p.m., we reached Peelamedu in a few minutes where we visited the Spinning Mill (where Pykara Power is used) and the Industrial Institute belonging to Mr. Rangaswamy Naidu. Resuming our journey and driving through Avanashi, Perundurai and Bhawani we reached Mettur at about 7 p.m. to enjoy a welcome rest at our lodging.

Fig. 10. The Mettur Dam and Reservoir.

Next morning (27th Sep.) we visited the Dam, the water works, the surplus Weir, the Pavilion, the infiltration gallery, etc., spending nearly three hours at it and taking photographic views.

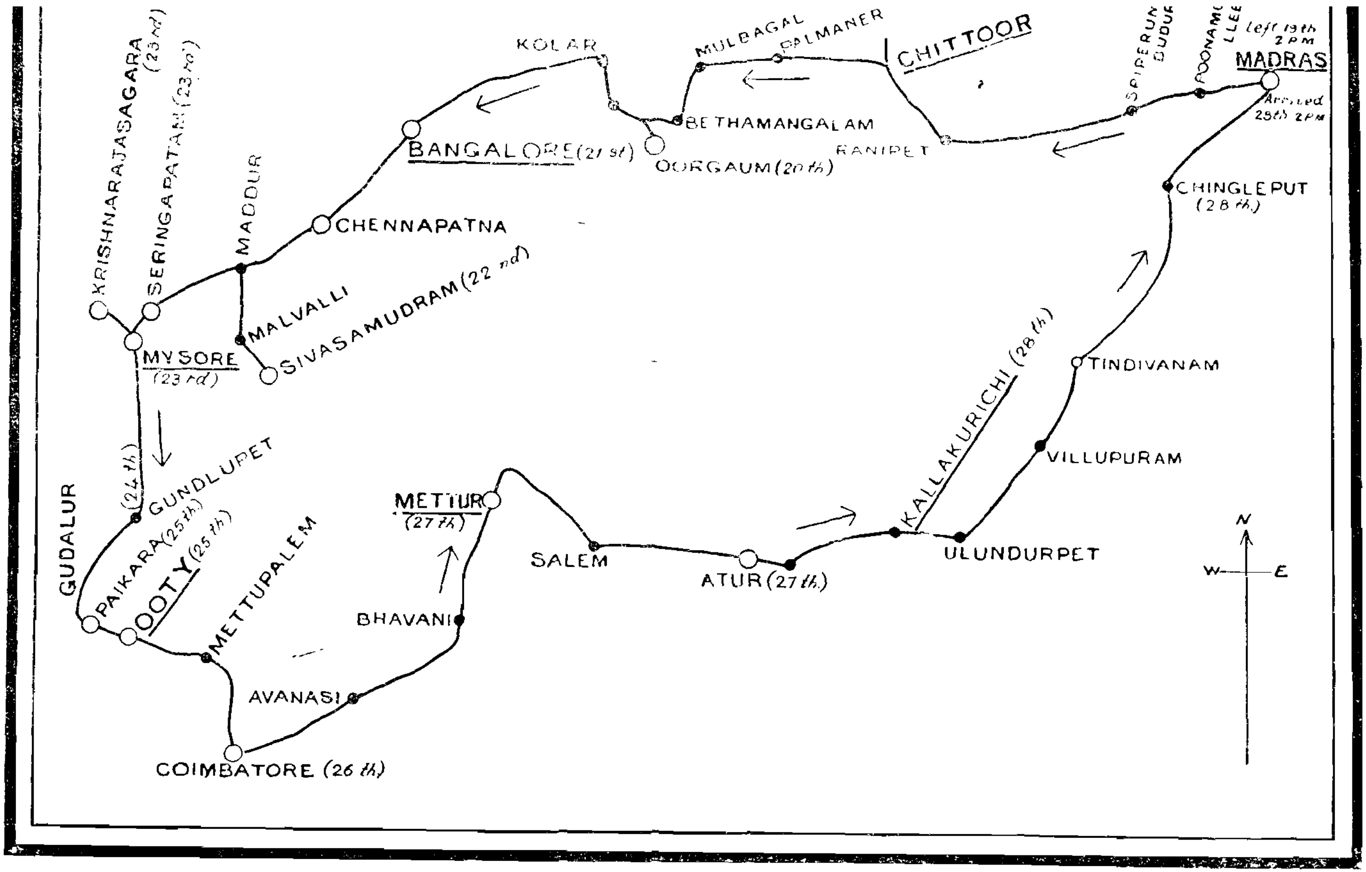

Fig. 11. Map showing Route of the Michaelmas Excursion.

After dinner we left Mettur and, passing through Mecheri, Omaloor, Salem (where we passed through the Magnesite fields) and Athur, broke our journey at Kallakurichi after sunset. Next morning the 28th Sept. 1934 we resumed our journey passing through Ulundurpet, Villupuram and Chingleput and reached Madras about 2 p.m., the exact hour when we left Madras on the 19th Sept. 1934.

The total distance travelled was just over a thousand miles in 10 days. Excepting one member, who was subject to malarial fever, the rest of the party were throughout in the best of health and spirits. The thoroughly safe and enjoyable run without even a single accident of any kind was due to a 1934 model Chevrolet in charge of Mr. Nair, a very experienced driver who had seen war service in the Army Transport Department.

This is the second long tour arranged by the Association, the first one having been conducted last year during Dasara by train and bus, the places then visited being K. G. F., Bangalore, Sivasamudram, and Mysore as also the Jog Falls and Bhadravathi. In place of the two latter, Pykara and Mettur were substituted this year. As in the last year, the total cost including food and ransport has not exceeded Rs. 40 per member. The value of such organised educational excursions, especially to students, cannot be overstated ; and it is to be hoped that they will become more common and frequent in the interests of sound education.

A SCHOOL EXCURSION TO KARNATGARH

A party of pupils of the E. L. M. Fabricius High School, Purasawalkam (Madras) under charge of their Geography master, Mr. S. J. Devasahayam, B.A., L.T., went on excursion to Vellore and Karnatgarh near Polur. The party left Madras on Friday night by Bangalore Passenger, and spent Saturday, the 1st August at Vellore, where they were lodged in the S. M. D. High School.

Starting early in the morning, the party, which was swelled by the addition of some of the teachers of the local school, climbed the main hill to the east of the town, and studied the ruins of the old fortifications as well as the prospect of the country round about as seen from the hill-top. The afternoon was spent in going about the town, and visiting important parts of it such as the fort, temple,

bazaar, etc. The same night the party together with teachers of the Vellore school left for Polur, where the Headmaster of the Board High School had made all necessary arrangements for climbing Karnatgarh, the next morning, besides getting his staff and students to join the excursion party, which now increased to over 120 persons.

Karnatgarh (3,180 feet) is the second highest peak of the Jawwadis, being exceeded by only one other peak a little farther west by about 200 feet. But, though slightly lower in elevation, it is the former that commands a splendid view of the central part of the Karnatic plains from Vellore in the north to Tiruvannamalai in the south at one sweep—a fact which easily explains why it was chosen for fortification (by Sivaji ?). As the foot of the hill is about 650 feet above sea-level, the actual ascent was over 2,500 feet, which had to be done by a bridle-path in disrepair, walking over which, with or without shoes, was equally a penance. After an ascent of three to four hours the party reached the fortifications on the summit, where they finished their mid-day meal. They then went round examining the fortifications, which were overgrown with jungle in most places. The trigonometrical stations could be traced within the fort—one 3,180 feet and the other 3,139 feet. The masonry building of the powder magazine was intact ; and the black powder, quite innocuous through age, was found heaped in a corner ; while an old cannon about three yards long was found rusting in a bush by the side of the bridle-path near the summit.

But what interested the party most was not the historical ruins so much as the glorious view of the Jawwadi Hills behind and the panorama of the plains with its pattern of fields, tanks and villages as far as the eye could see in the east, stretching from Kailasgarh near Vellore in the north to Tiruvannamalai in the south. With the help of the one-inch map it was interesting to identify landmarks such as Gingee, Nedunkunram Hill, etc., as well as the communication-lines and important places. The pleasure and profit gained were felt by all to be worth the trouble and expense of getting to that inaccessible place. By about sunset the party got down the hill and reached the Polur Railway Station. The nucleus of it, consisting of the boys of the E. L. M. High School, Puruswalkam, returned via Villupuram, reaching Madras on Monday morning.

The total cost for the Madras boys, who journeyed 300 miles by rail, was only Rs. 5 including food for two days and cartage. The success of the excursion was due mostly to the excellent arrangements made by the Headmasters and staffs of the S. M. D. High School, Vellore and the Board High School, Polur. The party was specially indebted to Mr. S. Srinivasa Iyer, Secretary of the North Arcot District Teachers' Guild, and to Mr. R. Kuppuswami Iyer, Headmaster of the Polur High School, who spared no pains to bring the excursion to success. The organisation and conduct of the excursion were by Mr. N. Subrahmanyam of the Teachers' College, Saidapet.

CHRISTMAS TOUR, DECEMBER 1934.

Another Thousand Miles by Bus

In connection with the Anantapur Geographical Conference it is proposed to organise a conducted tour for 10 days from the 19th to the 28th December 1934 from Madras to Anantapur and Hampi and back. In order to avoid the Christmas overcrowding in trains and to be able to visit quickly and conveniently a number of out-of-the-way places, the tour will be done by bus, especially as the Michaelmas experiment was found to be very satisfactory and advantageous. The following is the rough programme of the tour, which will give an idea of the route and the places proposed to be visited :—

19th December—Madras to Madanapalle.

20th December—Madanapalle to Kadiri, Lepakshi and Hindupur.

21st December—Hindupur to Penukonda (hill-climb), Dharmavaram and Anantapur.

22nd and 23rd—Anantapur to Bellary, Hampi, Gooty and back.

24th, 25th & 26th—Conferences at Anantapur.

27th December—Anantapur to Tadpatri (Alur water-fall) and Jammalamadugu (Gandikota gorge and fortress).

28th December—Jammalamadugu to Nellore *via* Penner route and thence to Madras.

The total trip will come to about 1000 miles, and it will take 10 days to complete. The total cost including food and transport is expected to come to about Rs. 35. Non-members of the Association will be charged a registration fee of rupee one. As there is only a limited number of seats available, those intending to join the excursion party are requested to register their seats by paying an advance of Rs. 10 before the 15th instant. The balance of the amount should be paid before the 18th instant. Details regarding kit etc., will be given to those that register themselves. Only a single bus is arranged for the present; but a second one can easily be got if there are sufficient numbers for it.

Gopalapuram, Cathedral Post,
Madras, 10th December 1934.

N. SUBRAHMANYAM,
Secretary.

News and Notes

As in last year, an Association excursion was conducted during the Michaelmas holidays, the places visited being Kolar Gold Fields, Bangalore, Sivasamudram, Mysore, Kannambadi, Seringapatam, Pykara, Ooty, Coimbatore, and Mettur. An experiment was made of doing the whole journey of 1000 miles by motor bus in 10 days. An account of it is given on another page.

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It is pleasing to note that school excursions have of late been getting popular in several schools of the Presidency. But very often they are treated more as opportunities for outdoor enjoyment and picnic, as a change from the normal work of the school than as a means of observational study. It is, therefore, proposed to discuss the values of school excursion and suggest the means of achieving the best result from them in the next issue of the journal.

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Single excursions and series of excursions of longer or shorter duration have had a new development in the Clark University, Worcester, Mass, where the Graduate School of Geography spends the whole of the autumn (September-December 1934) term in the field, studying the greater part of the Eastern United States at first hand. The party consisting of about 20 students is supplied with 7 motor cars, each furnished with a trailer to serve as sleeping quarters. From camps established at a series of points, intensive field work is carried out by means of local excursions round the selected points. Participation in this field school, followed by the satisfactory completion of maps and reports, would count as a full term's residence at the University. The prospectus sent to us includes a number of sketch-maps and illustrations, and explains the details of this interesting course.

* * * * *

The one-inch map of the school area has been included for study in the new syllabus in Geography for Form IV ; and on a representation made by the Secretary in accordance with a resolution of the Working Council of the Association, the Surveyor-General of India (13, Wood Street, Calcutta) has decided that "*single* copies of Survey of India maps may be supplied at half-

rate to Educational Institutions which are likely to store them properly and then bring them to the notice of students and others." It is hoped that Schools and Colleges will take advantage of the concession. The Secretary will be glad to inform those that apply for it the index number of the map of the school area.

* * * * *

Attention is drawn to the section on Geography and Education which will form a new feature of the Journal from this number. Teachers who have successfully worked out any experiments in the teaching of the subject are invited to contribute the results thereof for publication. Difficulties in handling any particular topics may also be communicated to the Editor for elucidation.

* * * * *

High Schools in the Presidency will have to decide shortly about the subjects in the C. Group which they would like to provide for in the Vth form next year in accordance with the revised S. S. L. C. scheme. We would recommend to headmasters and managements the desirability of having Geography as one of the optional subjects in all High Schools, not only as a discipline but also for the creation of that world outlook so necessary for every citizen in this rapidly changing world. There is a vague and unfounded fear in several places that the opening of Geography would involve a very heavy expenditure on equipment. We can assure the school authorities that for the efficient teaching of the subject a very modest sum would be enough to start with; and that a competent teacher can easily improvise several items himself, besides arranging to get locally made some of the costly apparatus and appliances. In the next number a list of minimum equipment for C. Group Geography will be published.

* * * * *

Two meetings of the Association were held in this term. In the first one Mr. N. Subrahmanyam delivered a lecture on *Hill-Climbing in South India* with Miss J. M. Gerrard in chair; and in the second Mr. A. Wimbush, Chief Conservator of Forests, Madras delivered a lecture on *the Forests of Southern India* with Mr. S. V. Ramamurthi, Director of Agriculture in the chair. Both the lectures are published elsewhere in this issue of the Journal.

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The Coimbatore Branch of the Association has shown fresh activity during the current year. At a meeting of the members held on 2nd September 1934, Rao Saheb C. M. Ramachandra Chettiar, B.A., B.L., was elected President of the Branch and

Mr. S. Natesan, M.A., L.T., Secretary. Under its auspices Miss Irene H. Lowe, M. Sc., F. R. G. S., delivered a lantern lecture on "*My Trip up the Nile*".

* * * * *

Nearly 800 geographers, representing 36 nations, assembled at Warszawa (Warsaw) in the last week of August 1934 for the 14th International Congress of Geography held under the auspices of the International Geographical Union under the presidency of Dr. Isaiah Bowman. A principal and most valuable feature of the Congress was the International Exhibition of Official Cartography in accordance with the tradition established at earlier Congresses. The previous Congress was held at Paris in 1931.

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We have to record the sorrowful news of the demise of Dr. Marion I. Newbigin, the talented Editor of the Scottish Geographical Magazine for 32 years and the author of several well-known works on Geography, in which she has covered the whole field of the subject, apart from her short papers. An eminent Geographer, who approached the subject through Biology, Miss Newbigin was among the pioneers of modern British Geography. She was the first to apply geographical technique in all that she wrote.

Reviews

The Continent of Asia. By Lionel W. Lyde (Macmillan & Co., London). Price 16*sh.*

Mr. Lyde has produced this masterly volume "from the same standpoint, on the same lines and in the same way as *the Continent of Europe,*" after having been at work at some parts of it at least for nearly two decades. The regional work was the outcome of twelve years' thought, the chapters being subjected to annual revision. As *peninsularity* has been made the key-note of the earlier volume, so *continentality* has been brought out as the main characteristic of *Asia.* The several regions are treated in different ways according to the peculiar human note of each of them ; and the vigorous individuality of the author is throughout in evidence both in the suggestive ideas and opinions and in the turns of expression.

This theory of *continentality* has been developed in the first part of the book by means of elaborate discussions in the chapters

on physical features, climate and vegetation, being gathered up in the last chapter of this part entitled "Some Controls". Students of history, who are familiar with the movement of Central Asian hordes into China on the one side and India on the other can easily question his statement that "in Asia the immense variety of relief is masked under a still more fatal immensity of size, with its inevitable climatic results; and the difficulties of communication over the continent as a continent have hitherto been almost insuperable etc." Thus the generalisations and comparisons, of which there are plenty in the book, are sometimes sweeping and unconvincing, though they are brilliant and suggestive, as is characteristic of the author. Several examples may be quoted from the chapters on detailed regional treatment, in the latter part of the volume, as in the statement on P. 359 "The isolation of India by sea has been in some ways especially down to the 17th century, more complete than its isolation by land", made in the teeth of the recent historical researches regarding early Indian colonisation in the East Indian Archipelago and of the accounts of the old Roman and mediaeval Arab trade with the west coast. Another example of a glib and sweeping generalisation is to be seen on P. 365 under the caption 'Oriental Mentality':—"Perhaps 'passive' is a more appropriate word, for the one defect was a lack of real activity; and the mental attitude of Indians is still what it was then. They observe, *e.g.*, abuses; they draw intellectual conclusions, *e.g.*, about a situation; and then they accept anything and everything. etc."

China and India naturally come in for a fuller treatment, which is however, characteristically subjective rather than objective.

There is a wealth of accurate and pertinent details that have been marshalled to support the description and the arguments; and a large number of sketch-maps illustrate this standard work of a veteran geographer, which ought to find a place in every library.

Observational Geography of the British Isles. By Herbert Hatch and C. R. P. Duckering. (Macmillan & Co., London). Price 2*sh.* 6*d.*

The sub-title of this book—"A Practical Geography with particular reference to the Home District"—points to the insistence on the approach to the study of Geography from the home region as the proper basis for the real understanding of the rest of the world. Believing that the mere drawing of maps, graphs and

diagrams could scarcely form the essential part of Practical Geography, the authors have rightly proceeded to emphasis the organised observation of streams, cliffs, roads, farms and other parts of the subject-matter of Geography as the real foundation for the proper study of the science.

The book falls into three roughly equal sections—physical, human activities, and regional; and in each of them there is great insistence not only on observation and doing, but also on correlation and comparison with the home region throughout. The children are thus given a real grounding in the main aspects of the physical and human geography of the British Isles together with an outline of its regional geography.

Though intended primarily for children of 11 or 12 years, studying in the lower part of Senior, Central or Secondary Schools of England, the material given is so complete that it can be used for revision work by candidates for School Certificate Examinations also.

Suggestive exercises at the end of each chapter and a copious inclusion of maps and pictorial illustrations enhance the value of this useful book, whose printing and get-up are neat and attractive.

Practical Map Books : Book 3—Asia. By S. J. B. Whybrow. (J. M. Dent & Sons, London). Price 10*d.*

This is the third book of the series of which the first two were reviewed in an earlier number of the Journal. Like the other two, this book also is intended to supplement the text-book and the atlas rather than to take their place. The working out of the given exercises on the blank maps is calculated to ensure a knowledge of topographical accuracy, besides helping the study of familiar material from fresh points of view. Starting with the study of the position and physical features of the continent, the exercises carry the student through the different natural regions of Asia and then finish up with a study of the density of population. The use of this series of books will prevent parroting in the study of geography, since the facts will be fixed in the mind as the exercises are worked out.

Bulletin of the Madras Government Museum—New Series: Vol. III, Pt. I. *The Three Main Styles of Temple Architecture Re-*

cognized by the Silpa Sastras. By F. H. Gravely and T. N. Ramachandran. (Superintendent, Government Press, Madras). Price Re. 1.

The object of this paper is to correct, in the light of the literal translations of the original texts, the current identification of the *Nagara, Vesara,* and *Dravida* styles of temple architecture, characterised by the quandrangular, circular and octagonal *sikharas* respectively. That the *Dravida* style is that of the Dravida (southern) country, the earliest existing remains of which are Pallava, is generally agreed. As regards the other two styles, which may be called northern, the connecting of the *Vesara* with the Telugu country is questioned. The *Nagara* style, which developed in the Chalukya country, is thought to have included the Kadamba style also.

Books and Journals Received

Practical Map-books: Book III.—By S. J. B. Whybrow.

Observational Geography of the British Isles.—By H. Hatch and C. R. P. Duckering.

Bulletin of the Madras Govt. Museum: The Three Main Types of Temple Architecture.—By F. H. Gravely and T. N. Ramachandran.

Report on the Operations of the Department of Agriculture. 1933-34.

The Educational Review—August, September and October, 1934.

Kalaimagal—August, September and October 1934.

The Educational Review—August, September and October, 1934.

The Indian Journal of Economics—July and October 1934.

Prachina Karnataka—April 1934.

Our Home Magazine—August 1934.

The Scottish Geographical Magazine—September 1934.

Geography—September 1934.

The Geographical Review—October 1934.

Educational India—October 1934.

Journal of Indian History—August 1934.

Indian Educator—August, September and October 1934.

Journal of the Andhra Historical Research Society—April 1934.

The Fifth Geographical Conference

At Anantapur, (24th to 26th December 1934).

The Fifth Geographical Conference has been arranged to be held at Anantapur from the 24th to the 26th December 1934 along with the Provincial Educational Conference, when papers on various aspects of the Geography of Anantapur District will be read and discussed. Dr. J. H. Cousins has kindly consented to preside over the Conference ; and Prof. A. V. Venkatarama Ayyar of the Ceded District College is the Chairman of the Reception Committee. The following is the Programme of the Conference : —

24th December, Monday 3-5 P.M.—Opening Session.

25th December, Tuesday 8-11 A.M.—Second Session.

26th December, Wednesday 8-11 A.M.—Concluding Session.

The following are among the papers that have been arranged : —

1. *Historical Geography of Anantapur District.* By Prof A. V. Venkatarama Ayyar, M.A., L.T., Ceded Districts College, Anantapur.

2. *Physical Geography of Anantapur District.* By Mr. R. Sridhara Rao, M.A.

3. *Geology of Anantapur District.* By Mr. V. D. Krishnaswami, M.A.

4. *Meteorology of Anantapur.* By Mr. C. K. Anantasubrahmanyam, M.A., Kodaikanal Observatory.

5. *Agricultural Geography of Anantapur District.* By the Agricultural Demonstrator, Anantapur.

6. *Economic Geography of Anantapur District.* By Mr. N. R. Subbier, M.A.,L.T., Lecturer, Ceded Districts College.

7. *Communication-Lines and Town-Sites of Anantapur District.* By Mr. N. Subrahmanyam, M.A., L.T., F.R.G.S.

8. *Urban Geography of Anantapur District.* By Mr. R. Dann, Director of Town-Planning.

9. *Population of Anantapur District.* By Mr. K. Srinivasaraghavan, M.A.

10. *Public Health and Environment of Anantapur District.* By Mr. N. Natarajan, M.B., B.S., B.S.Sc., District Health Officer, Anantapur.

11. *Place-Names of Anantapur District.* By Dr. C. Narayana Rao, M.A., Ph. D., Lecturer, Ceded District College.

12. *Sub-regions of Anantapur District.* By Mr. G. Narayanaswami, M.A., L.T., Dip. in Geo., Model High School, Saidapet.

13. *Kadiri Region.* By Mr. T. Abdur Rahman, M.A., L.T., Dip in Geo., Board High School, Dharmavaram.

14. *Hindupur and its Environs.* By K. Nanjudappa, B.A.

15. *Gooty and its Environs.* By Mr. V. Koprasa Char, B.A., B.Ed., London Mission High School, Gooty.

After the Conference is over, excursions will be arranged for important places in the district such as Tadpatri, Gooty, Lepakshi near Hindupur, Penukonda, etc., as also to Hampi in Bellary district.

Members from all parts of the Presidency are invited to attend the Conference and make it a success. Arrangements for messing and lodging will be made in the College Hostel at rupee one per diem. The Secretary will be thankful if members who intend to attend the Conference will kindly intimate to him beforehand (not later than the 18th December 1934). A concession rate may be given if the mess ticket is purchased for three days together.

Special concession rates for railway journey have been announced by the M. S. M. Ry., which with the usual Christmas concession allowed by other railways may be availed of by members at distant places for a visit to this district. The weather is generally, clear, cool and agreeable in December in the Ceded districts ; and some warm clothing may be taken.

Members in far-off places in the Presidency, who have had no opportunities of seeing these parts (known as the Ceded dis-

tricts), will be amply repaid by a visit to Anantapur and the other important places in and about the district. In several respects it will be highly enjoyable and profitable to join the geographical tour which will be arranged at the time of the Conference.

Gopalapuram, Cathedral Post,
Madras, 10th December 1934.

N. SUBRAHMANYAM,
Secretary.

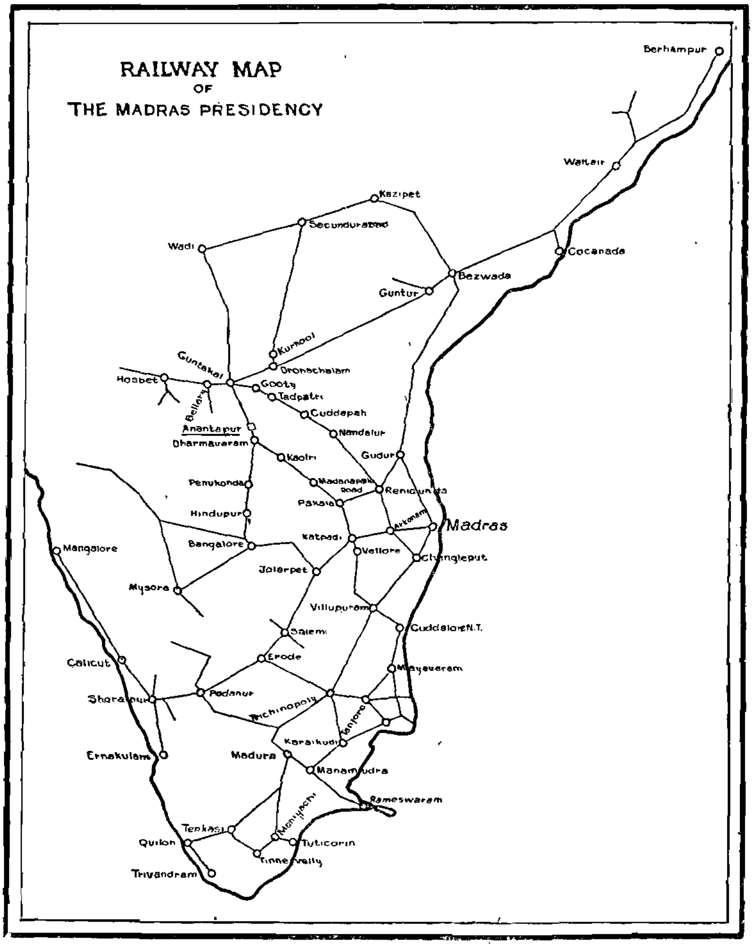

Fig. 12. Railway Map of South India.
Madras to Guntakal, Guntakal to Bangalore and Bangalore to Madras—belong to central section of M. S. M. Ry. and can be covered in Rs. 10 at concession rate.

The Journal of
The Madras Geographical Association

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Fifth Geographical Conference at Anantapur

(24th December, 1934)

PRESIDENTIAL ADDRESS

By

Dr. J. H. Cousins, M.A., D.Litt.

Ladies and Gentlemen,

It gives me very special pleasure to be here to-day, presiding over the Fifth Conference of the Madras Geographical Association, with the inception of which, nine years ago, I was identified, not only as a foundation member, but also in having the privilege and responsibility of delivering the inaugural address on the historic occasion of its first public meeting. My interest in the Association is therefore of a somewhat paternal kind, and includes excusable pride in its achievement and solicitude for its future development and progress.

Such being the case, I am naturally tempted to indulge in parental reminiscence and to touch on the varied activities of the Association, though the nomadic nature of my life during the past few years has prevented my taking more than a spectatorial interest in its work, and though you will more appropriately take stock of your achievements *in extenso* at your first decennial celebration next year.

You have, by means of lectures, papers and addresses, made studies of South India from various geographical points of view, and have recorded the results in your Journal, which is a clearing-house of geographical thought and research.

By means of summer schools and refresher courses you have sought to fulfil another of your chosen objects, and have helped to improve the methods of teaching geography in many schools in southern India.

Through the excursions which you have organised, sometimes as part of summer school work, you have demonstrated that the right place for the study of real Geography is in the field; that geographical books are to be found in running brooks, and geological sermons in stones; that facts and inferences of Geography are more intelligently studied in their natural setting than by any description or imitation of them within class-room walls, useful though these descriptions and imitations are as accessories.

In your annual Conferences you have attempted to make detailed studies of particular districts as a team-work from different points of view, thereby not only adding to the sum total of geographical knowledge, but interesting the people of the chosen district in their own particular environment, and incidentally disclosing to them the potentialities of their own region.

To these particular activities you have added that of dissipating the poor opinion of the subject of Geography that was generally held in India before you began your work, and of securing for it in India the same position in educational respect as it has long had abroad. By undertaking all this much needed work your association has won for itself a high place among the active educational institutions of the country.

So much for your effort and achievement; and when we remember that it is the record of a body not yet numbering five hundred members, we can assuredly anticipate much longer steps towards the goal of making Geography an integral part of education in India, if the Association can only win the co-operation of the thousands of teachers, and not only of those who teach Geography, to whom the subject should appeal as one of the most stimulating, idealistic and at the same time realistic, means to a complete education, a real educing of human capacity. In such work as that of the Madras Geographical Association, numbers give the strength and confidence by which things can get done. They also bring greater additions to knowledge, wisdom and experience, and lead to a wider broadcast of what is worth broadcasting. I suggest that, as a special decennial effort, each member should not only see that he himself is in good standing on the register of the Association, but should induce another friend to join it during its tenth year, and thus change the denomination of membership from the monotony of *hundreds* which it has so long maintained, to the refreshing denomination of *thousands*.

The Association needs all the strength and prestige it can derive from members and consequent extension of work in order to bring about the much needed improvement in the position of

Geography in the educational systems of India, and in order that geographical research may be carried out in a more extensive, intensive and fruitful manner.

Let me recall to your minds, in this connection, the present unsatisfactory state of affairs concerning the position of Geography in schools and colleges in India. In all the important universities abroad, Geography is not only an ordinary graduation subject, but qualifies also for Honours, Master's and Doctor's degrees in both the Arts and Science courses. It is a tripos subject at Cambridge, and is one of the main subjects in the competitive examinations for the Civil Service.

And how does Geography stand in the South Indian universities? In none of them has it been accorded its proper place. In the University of Madras it has a nominal position in being accepted in theory as a degree subject; but Branch VII has no existence outside the University Calendar. The position of Geography in the Intermediate stage is not very much better than it is in the degree stage. It is true that the University of Madras and the Andhra University have Regulations concerning it. But in the University of Madras it has a slender and precarious existence in one college only, and that a women's college, which provides for the teaching of Geography at the Intermediate stage, but finds itself in a blind alley since the students cannot continue the subject in the degree course.

In the early enthusiasm for Geography, when, as a result of the Slater-Grieve Committee's recommendations, it was included for the first time in the remodelled Intermediate course of the University of Madras, as one of the optional subjects in the Science group (Part III, Group I), five affiliated colleges immediately started teaching it, and attracted a number of students. But the exacting demands of the University in regard to equipment and formal teaching qualifications quenched the enthusiasm, and the colleges were forced to close the new branch.

Had the University been seriously disposed towards the subject it could have given a reasonable time for such improvement in equipment as is now being effected in other cases. The teaching staffs, who though they had not the required formal qualification in the shape of foreign degrees, were found to be competent on account of their knowledge of and enthusiasm for the subject, might have been temporarily accepted until teachers with the requisite paper qualifications were available. But unsympathetic red-tape and unresponsive Regulations finished the matter. Ten other colleges that had given notice of their intention to start Geography in the Intermediate course took the warning, and confined

their endeavours to the more academically profitable if less educationally valuable subjects, and another instance of pedagogical opacity was added to the history of education in India. And now, when the awakened conscience of the University of Madras has induced it to try to make amends by providing the requisite qualification in a Diploma Course in Geography, the colleges are in no mood for reopening or starting the teaching of the subject, though convinced of its high educational value. This is partly due to the general financial depression; but it is also partly due, I gather to the memory of the past action of the University and fear of its repetition. I sincerely trust that steps will be taken on both sides to dissipate this inhibition.

This regrettable state of affairs has not only kept Geography out of the colleges, but has had a detrimental effect on the subject in the schools. The graduate teacher of other subjects enters the Training College with a guaranteed previous knowledge of his subject. But in Geography alone there is, in the Training College, the paradoxical spectacle of prospective teachers being taught the pedagogy of a subject without a previous knowledge of the actual subject—a striking but lamentable example of putting the cart before the horse, and also of giving official patronage to the mere bookishness of much of Indian education that good educators deplore. Such a practice, which would not be tolerated in any other subject of a scientific kind, puts a premium on shallowness, and explains, though it does not justify, the widespread but false notion that anyone is fit to teach Geography. I know from my own experience as the head once of the Geography department of an Irish High School how utterly wrong such an idea is, and what educational riches are being allowed to lie unused, under surface ignorance as to what Geography really stands for in applied knowledge, informed intelligence, and faculty development.

Obviously the Training Colleges should take advantage of the Diploma course in the University as an essential preliminary qualification of a teacher undergoing training in Geography, and should take in such diploma holders irrespective of previous service, guaranteed appointment, or other restrictions, which may or may not be necessary in normal circumstances, but should be temporarily waived in the case of a new subject. If sufficient diploma holders are not available for training in the subject, then others might be chosen under the conditions that they should have handled the subject for a certain minimum time. If the heads of Training Colleges acted thus, they would induce a beneficial steadying of the Diploma course, since more graduates in allied subjects would find it worth their while to undergo the course, which would thereby

become more popular and remain so until effective provision was made for the teaching of Geography in the degree course.

I hold, along with you, that Geography should be one of the "constants" of school education. Indeed, I go personally further and hold—that I am not here as a propagandist of the idea—that if primary and secondary education were Geographised (if I may coin a word), that is, if knowledge were based on the environing life of the student, it would become much more evocative of human capacity than it is. It would also demand extensions of special aspects at college level, and thus influence so-called higher education, instead of being, as it is now, to its detriment, largely dependent on university initiative. The result of this dependence of school Geography on the influence of non-existent college Geography is that, of 20,000 candidates in the S. S. L. C. examination, only about 200, or one per cent, take Geography in the C-group, since, as we have already mentioned, there is no provision for its continuance in any of the men's colleges and in only one women's college affiliated to the University of Madras.

Observe the vicious circle in which the matter is imprisoned. Colleges, like my own, that earnestly desire to affiliate in Geography in the Intermediate course, hesitate to do so lest no students coming up from the High Schools should apply for it. That is one side of the circle. I know the other side also, because, in addition to being the Principal of a first grade College, I am Correspondent of a High School, and am aware of the impossibility of getting students to take up C-group optional Geography for the S. S. L. C. examination, for the plain and understandable reason that there is no available provision for carrying on the study in a college. Such a state of affairs in regard to one of the most valuable phases of education obviously calls for drastic and prompt attention by the educational authorities.

The situation of Geography in the schools is even worse than I have indicated above. In the 1930 scheme it was a subject in Group A, and given in all the high school forms. Under the scheme of 1934, with Geography as a discouraged optional with no future, the last geographical knowledge that the pupil will receive will be in the fourth form. What little has been learned up to that stage becomes useless, and two valuable educational years are geographically lost—and this at an epoch in human history when the life of the humblest inhabitant of the remotest village in India is in some degree affected not only by happenings but by the influence of anticipated happenings on the other side of the world, happenings whose interpretation rests largely upon geographical facts.

Something could, of course, be done to ease this impossible situation if Headmasters would only encourage students to take Geography in a group, say with Physics. Such a group would be mutually helpful through the affinities of the subjects, and could become both popular and educationally most useful. The Science subject could be carried over into the Intermediate college course until some wise action by the University gives geographically minded Principals, like myself, the push and excuse to intimidate their managements into making the necessary provision for teaching Geography.

The syllabuses and teaching of Geography in the middle and lower schools are decades behind the times both in presentation and practice. The text-books make a sorry contrast in their substance and get-up with text-books in other countries, and this does not arise from lower finance but from lower taste. The teaching still treats the minds of the children as godowns for the storage of facts instead of cultural thoroughfares, and has very little practical application or actual contact with the wonder and magic and joy of Nature. Reform is here needed perhaps more urgently than anywhere else, for here the foundations of the geographical edifice in the mind are laid. And one essential element in such reform is the provision of text-books, compiled in attractive form, in the modern spirit, oriented to the Indian scene—even to northern and southern divisions of it because of characteristic and highly informing geographical variations—and written in the mother-tongue of the student.

With the teaching of Geography treated as it is in the schools and colleges of South India, it would be more than optimistic to expect the higher aspects of geographical science to fare better. Geographical research, as it is practised in other countries, is unknown here; not simply a more or less freakish working up of peculiarities for the sake of personal distinctiveness, but the true co-operative investigation into apparently important but imperfectly known matters such as geographical science stimulates and always rewards.

It is true that research in any subject is technically a "higher study", sometimes glimmering on the hither side, but mostly on the thither side, of the horizon-line that is marked "B.A." or "B.Sc." on the diagram of academical achievement. But real research completes the educational circle by presenting fuller knowledge and rectified methods by means of which the elementary teaching of the subject may be brought nearer reality. In Geography, I will venture to claim, research is not merely a higher

study, but should be its essential and continuous technique from the lowest standard onward. The data of geographical study are always at hand, always varying, always capable of some degree of mental and emotional appreciation by the youngest student, always vibrating with significance to the geographically minded.

I can recall vividly the look of illumination on the face of a Tamil boy of the farming community when, in an unofficial Geography class, which I instituted and taught in the Theosophical High School at Madanapalle seventeen years ago, he discovered the rhythm of wet and dry years in a graph that he had made, and called my attention to the possibility of adjusting agriculture to recurring climatic changes if such records were maintained for a long time. That subject and many others are asking for study. There is not a phase of human life that would not be the better of geographical illumination. The bearing of Geography on History has been given academical recognition for some time; so also has its bearings on Economics. But little or nothing in the way of actual work along such lines has been done in India in comparison with what has been done and is being done elsewhere, notwithstanding the challenge and invitation of the vastness and variety of the Indian field.

I know, from personal participation, the infective enthusiasm, the intellectual delight, and the sense of being in touch with realities that is inherent in such research; and I envy the teachers and students of other lands who have the opportunity and encouragement to attain such experience. I shall relate an example of how educational authorities elsewhere deal with geographical research.

When Geography, in the modern sense, became a grant-earning subject in secondary education in Ireland in 1909, summer courses for prospective teachers of Geography were instituted by the educational authority. Great geographers were brought to Dublin to lead the courses. I was then the head of the Geography department of The High School, Dublin, which was the principal feeder school of Trinity College, but I was not eligible for the first summer course because I had not taken a two-years course in preliminary science which was required of candidates, my interests as a young teacher having been mainly literary and pedagogical. I happened, however, to have published the first "Text-book of Modern Geography for Irish Intermediate Schools", and this book had found its way into the summer course from which I, its author, was closed out. It had also happened that my department of the school, which had been opened by a wise Headmaster some years before the official recognition of Geography purely as an educational subject and would be continued even if never a shilling

of grant was earned, had become recognised as a model, and had been occasionally visited by school inspectors with an hour to spare who wanted hints on geographical teaching. The authorities, being either Irish or long enough resident in Ireland to be able to see a joke, appreciated the humour of my situation, and invited me to the second summer course—not as a student-teacher, but as a demonstrator to Professor Herbertson of Oxford and to Professor Grenville Cole, the famous geologist, who was then Dean of the Royal College of Science in Ireland in which the course was held.

But the point concerning the bearing of Geography on History and Economics is this. I happened to refer to the peculiar fact that my native city of Belfast, to whose first *Lord* Mayor I had been private secretary, had won world-renown for certain industries—such as linen-weaving, rope-spinning, ship-building—yet had to procure the raw materials for these from other countries. This brought up the question of the beginnings of these industries, and led to French history and the migration of Huguenots to Ireland, and to psychological considerations arising out of human character, also topographical, geological and agricultural features around the city. Educational intiative had provided a sum of money for any spontaneous geographical adventures that those at the head of the course might consider worth while. Result: forty teachers, men and women, Protestants and Catholics, were sent under specialists a hundred miles in a saloon carriage by rail, three miles by electric tram-car, and three or more miles on foot, from Dublin to the summit of the Cave Hill overlooking Belfast, where I had to give a talk on the economic progress of the city which lay as a model below us, with vast shipyards and forests of tall chimneys, telling of human industry, spread over areas where as a schoolboy I had wandered through grass and waded swamps and jumped ditches. Next week the student-teachers presented illustrated essays based on what they had seen, what I had told them, and what they had read in the library of the college.

Such adventuring in knowledge is but a tiny fraction of what any province of India offers to education, and not only on the historical and economic aspects of human life, but on the deeper influences of environment on religion, philosophy and art. Geography, in one of its departments, can explain why the figure of Ganesh in South India is depicted usually sitting, while a Ganesh on a lamp that came to me from Nepal is in an energetic standing position. Another department has something to say on the difference between the stone structure of the Dravidian style in Madras

Presidency and the brick structures of Paharpur in Bengal. The tip-tilted roofs of the west coast; and the similarity between the entrances to temples on the road between Alleppy and Quilon in Travancore and those to temples in China and Japan; the affinity between certain temple roof-shapes in Cochin and the Temple of Heaven at Peiping; these and other related matters do not concern only the student of archaeology, art or ethnology: their interpretation will remain incomplete until the geographer says his say regarding them.

I need not labour this point further. The question is, cannot the new Geography Department controlled by the University of Madras be utilised for the undertaking and the patronising of such good work, and for the encouraging of general geographical education, both indirectly by dignifying the subject in the estimation of all concerned and directly by expanding knowledge and improving method. In any event, here is an urgently needed work for the Madras Geographical Association itself to undertake, and a patent reason why all interested in the subject should join and support the Association.

I have referred to the excursions which you have popularised. The opportunities for these have much increased in recent years through the development of travel facilities. Long distance excursions by rail are easy and cheap. The development of traffic between points away from the railways has opened up incalculable possibilities of geographical field-research in areas where History and Art and the movements of human groups await recovery and interpretation.

Here we come upon a consideration to which I attach very great importance from the educational point of view, that is, the point of view of drawing out all the powers of the individual, the emotional no less than the mental and bodily powers. The relationship between Geography and aesthetical sensibility—a crying need the world over and specially in India—may at first mention appear very remote; but I am convinced that the full geographical experience cannot be attained without the thrill of wonder and joy that is the sign of man's kinship with the mystery and beauty of nature.

Textual work and laboratory demonstration can, of course, give that thrill. I shall never lose the memory of my emotional response to my first sight of the Atlantic foramenifera under a microscope. The scientific fact of myriads of microscopic entities coming into and going out of existence in a day, yet laying with

their almost invisible shells the foundations of aeonian geological history, was itself immensely impressive, but somewhat stultifying to a conscious human being placed midway between minuteness and vastness that seemed to take no count of him and his problems educational or other. But the intimate sight, through the lens, of the almost invisible spot of white that I had picked with tweezers out of a handful of Atlantic ooze, put me in emotional rapport with both the infinitely little and the infinitely great, for it touched the creative artist that is in me, (and in every normal human being though frustrated and starved by incomplete education), by its exquisite form, its incomparably beautiful sculpture, its pure colour, its infinitely delicate texture. Recognising these qualities, I realised that I myself shared them, otherwise I could not have recognised them. I was not merely a spectator of unresponsive cosmic processes but a participant in cosmic creative joy, the *ananda* of the universe.

But laboratory demonstration is restricted by room-space and by paraphernalia which can only be used by a few; while nature, in her ever busy laboratory, workshop and studio and on her perpetually moving stage, is waiting to open out her secrets and share her life with those who will open themselves out to her revelation and influence. Geographical excursions, therefore, should be neither irresponsible *tamashas* nor occasions of mere peeping and botanising such as Wordsworth very rightly reprobated. It is true that you can get special clarity, accuracy and assurance from research along a short base-line. But in a true geographical survey, as sometimes happens in a chain survey, the offsets may lead us to much more interesting and valuable points than the A to B of the scientific base-line. In saying this, I am not saying that the base-line can be ignored, for without it, mental data would be unintelligible because unrelated, and emotional reactions would be chaotic because undirected. What I desire is balanced completeness.

It comes, then, to this; that geographical teaching, study, research, or field adventure, while seeking, recording, tabulating, graphing, and interpreting meteorological, geological, and biological facts as to the substance, organisation, and functional activities of the various constituents of human environment, should be conscientiously accompanied by aesthetical pleasure in design, colour, texture and perfume. A countryside paced out for a plan or rummaged for specimens should also be enjoyed as a landscape. A barometrical or thermometrical reading should lead us out from an instrument to enjoyment of the sapphire of noon or the gold of sunset. In this way, Nature will find opportunity to speak to man

with greater truth because with greater beauty, and the commonplace will become invested with grace and significance. Moreover, other human faculties than those used in purely scientific investigation will be called into activity. Contemplation, as distinct from observation, will be aroused; aethetical enthusiasm will pass over into the creative impulse that moves through all beings, and individual and group life will inevitably and peacefully be moulded "nearer to the heart's desire".

This I take to be the ultimate Geography towards which the science is evolving, Creative Geography that, when practised in the education of the young and maintained in the interest of life through the future universal adult education, will bring into being "the great race" to which the poet Yeats looked forward. It will also, I believe, ultimately affect for good the aspirational aspect of human nature, and bring the religions nearer to the truth of life and nearer to a truer worship of the One Power and the many Powers that are shaping and energising the universe. Powers that Science calls by various impersonal names and religions personalise as God and the Gods.

Permit me to add, as a Gothic finial to the foregoing edifice of geographical belief, an example of the creative influence of Nature as expressed in verse. The following lines, entitled "Invitation at Sunset", were my own reaction to certain sights and sounds noticed on a walk in the fields around Madanapalle College. Looking at them now, with critical objectiveness, nine months after their composition, I see that they move from observation of the panorama of life on the earth to the impressive pageantry of sunset, and pass into contemplation and reverence. Of the complete artistic effect and quality of the poem it is not my office to speak.

Come where the coriander its aromatic breath
Exhales as a loosened spirit that seeks not the
  boon of rest;
Where, high in the tamarind, mews like a kitten
  the bird of death,
Its eye on the chittering weaver-bird that shrinks
  to its nest.

Holy the daylight was; as holy shall be the dark:
Holy the place and the moment where life to life now calls:
Holy the shrine-topped *kondas* that eastward and
  westward mark
The Day-God's myriad births and myriad burials.

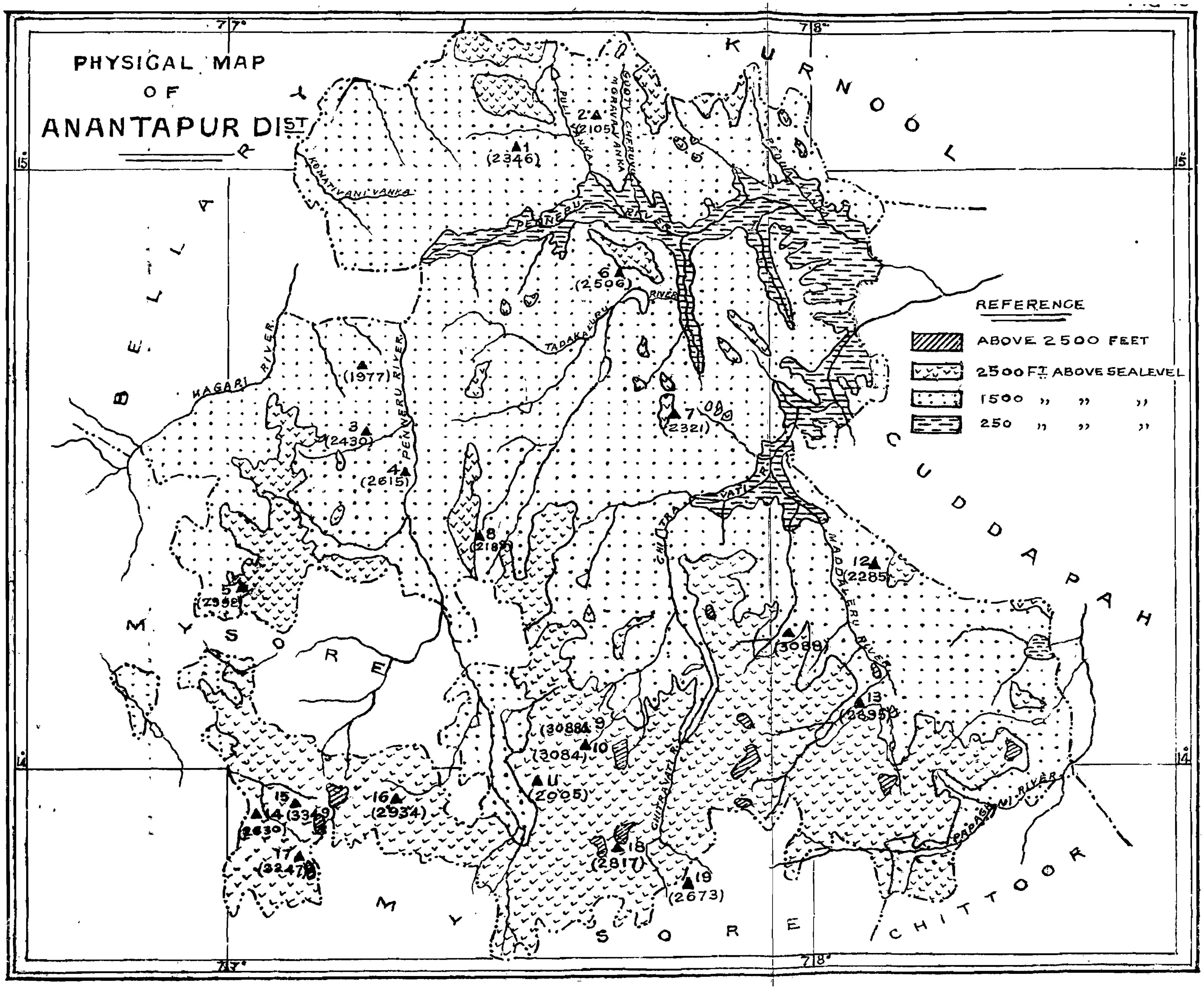
Shall we hold that the Day's fulfilment is all on the
  forehead bowed

Of Light by Darkness dethroned and humbled in red retreat?
Nay, look you! above the standards of Night a crimson cloud
Floats as a flag from a bastion denying the Day's defeat!
A million days . . . and a million . . . and the end thereof
who knows?
What will be, will be. What is, our lifted hands acclaim.
Lost not in the sweet and splendid sadness of how Day goes,
We lose not the joy of the triumph and wonder of how
it came.

Ladies and Gentlemen: I may seem to have wandered far from the immediate concerns of a Conference of Teachers of Geography and sympathisers with the subject; but I have long felt that the ultimate best service to anything is rendered when, in addition to dealing with particulars and departments, we seek for inclusive generalisations in which details are implied and co-ordinated. In doing so, we are simply anticipating the trend of geographical development from its early plain record of observed facts to its enrolment among the biological sciences as œcology, the study of the constituents of human environment and of man's responses to them. We are now entering the psychological phase of geographical history. Aesthetical Geography has been suggested. I myself suggested some years ago that Geography would not always remain at the stage of answering questions as to *How?* of things, which is the function of science, but would some time be interrogated as to the *Why?* of things. Then it will take on the role of philosophy, and its true name will not be "Geography", the describer of the earth, but "Geosophy," its interpreter. After that it will reach the creative phase, and its still truer name will be found.

Meanwhile, we address ourselves to the work of the Conference. You will, as at former Conferences, listen to papers on various aspects of the Geography of the District of Anantapur, an area presenting much geographical interest, climatic, geological, historical, economic, and cultural. I shall not steal any of the geographical thunder of the essayists by anticipating their contributions. But I cannot resist the temptation to hope that the cultural aspect of the study—that is, the influence of environment on the higher phases of human life and expression, manners and customs, folk-lore, arts and crafts and literature—will receive as much attention as the physical and utilitarian aspects.

I have much pleasure in declaring the Fifth Conference of the Madras Geographical Association open.



PHYSICAL MAP
OF
ANANTAPUR DIST
REFERENCE
ABOVE 2500 FEET
2500 FT. ABOVE SEALEVEL
1500 " " "
250 " " "
KURNOOL
BELLARY
CUDDAPAH
MYSORE
CHITTOOR
PENNERU RIVER
TADAKALURU RIVER
HAGARI RIVER
PENNERU RIVER
CHITRAVATI R.
PAPAGNI RIVER
MADDALERU RIVER
KONATIVANI VANKA
GUTY CHERUVU
77°
78°
15°
14°
(2346)
(2105)
(2506)
(1977)
(2430)
(2615)
(2321)
(2285)
(3084)
(2905)
(2934)
(2630)
(2817)
(2673)

The Physiography of the Anantapur District

By

Mr. P. Sridhara Rao, M.A.,

Anantapur, Bellary, Kurnool (except four taluks) and Cuddapah were ceded to the East India Company by the Nizam in 1800 and are known as the Ceded Districts. In shape the district of Anantapur is roughly a rectangle except the south-eastern taluk. Madakasira is separated from Kalyandrug Taluk by a part of the Tumkur District of Mysore State. On the west Anantapur is limited by longitude 76° 50′ and on the east by 78° 30′; north to south the district is longer lying between latitudes 13°.40′ to 15°.15′. The district is bounded on the east by Cuddapah, on the north by Kurnool and Bellary, on the north-west by Bellary and on the west and south by the Mysore State. To the south-east of Anantapur lies the Chittoor District.

This district is the southern and south-eastern termination of the Deccan Plateau. The general slope of the country is towards the north. But in the northern portion the slope is towards the east. The larger rivers of the district therefore flow due north, east or north-east. The main rivers which drain the country are the North Penner or the Uttara Pinakini and its tributary Chitravati. The general slope towards the north is up to the bend of the Penner after which there is a gentle rise in the Gooty Taluk and the northern part of the Tadpatri Taluk. The western parts of Gooty, Kalyandrug and Madakasira slope to the west towards the river Hagari.

Penner or Penneru takes its rise in the Nandidrug Hill on Mysore Plateau. From its very source it has a northerly trend. It enters the Anantapur District in the extreme south of the Hindupur Taluk. It is the most important river in the district flowing through seven taluks and receives in its course the waters of the eastern taluks by its tributary the Chitravati. Its course of about 130 miles can be sharply divided into two parts. First it flows directly north passing through Hindupur, and the western margin of Penukonda and Dharmavaram, and then through Kalyandrug and Anantapur. It forms a natural boundary between Gooty and Anantapur Taluks for a part of its course.

Lastly it flows across Tadpatri Taluk into the Kurnool district. Pamidi and Tadpatri are the only two towns that lie on the banks of this river. The river bed is wide and sandy and the banks are usually low. Among the hills, especially near Penna Ahobilam, we find the river channel narrow and the bed rocky. The river bed is dry for a major part of the year. The freshets that come down during the monsoon flow for a few days after which a small narrow channel of water persists for a short time before the bed dries up again. Irrigation under the river is done by diverting a part of the water from the bed into the channel by means of sand dams. These sand dams are of a temporary character and are washed away by the next flood.

The Chitravati rises in the north of Nandidrug in Mysore east of the head-stream of the Penner. It enters the Anantapur district near Kudikonda hill in the south of Hindupur taluk, and travels north across the taluk and then enters Penukonda. In the latter taluk it has made for itself a narrow gorge through the hills. After several miles of swift flow it enters the plain of Bukkapatnam. Here the water enters a large tank where it is stored for irrigational purposes in the neighbourhood. After filling this tank the river, now a very narrow small stream, resumes its course. It flows due north into the Dharmavaram Taluk. Near Dharmavaram town the river again forms a tank. To the north-east of the tank the Chitravati starts again. It is now more lucky, for it soon receives a number of other streams and attains a considerable size. It leaves the district after a sinuous course and joins or rather flows into the Penner near the Gandikota gorge in the Cuddapah district. This river is dry throughout the year except during the freshets.

Maddaleru River. There are a number of hills separating the Penukonda and Kadiri taluks. Small streams from these hills join together and form the Maddaleru. This stream attains a considerable size in the northern portion before it empties itself into the Chitravati at the village of Chinnachigullarevu.

Hagari River, an important tributary of the Tungabadra forms the natural boundary between Mysore state and Kalyandrug on its north-western side.

Jayamangali takes its rise in the Mysore Plateau and after flowing in Hindupur taluk for about 15 miles it joins the Penner at Utakuru village. It is a river worth mentioning because of its considerable size.

The Tadakaleru is a river of local importance. Rising in the southern portions of the Nagasamudram line of hills it flows north-eastward into the Singanamala tank.

The Pandameru is another small river which feeds the Anantapur tank. The waste water of this tank continues this stream, which joins the Tadakaleru before it feeds the Singanamala tank.

In addition to the above, there is a number of small streams which feeds the Penneru from both sides. Also there are nearly 800 tanks in the district which depend for their supply on temporary streams called *vankas*. It must be clearly understood that all the rivers abovementioned are almost free from water for a large part of the year. The *vankas* are even more so. They just serve to collect the waters from local showers and feed the small tanks. Of course this source being precarious and the tank bed being gradually silted up, the tanks and the *vankas* that fill them play a little part in the economic condition of the people.

Orography. There is a large number of hills in the district. The general level of the country is high, especially in the southern and central portions; and the land ranges in elevation from 1,500 to 2,000 feet above sea level. It is this elevation that makes Anantapur enjoy a fairly cool climate for about 8 months in the year and prevent it from being as hot as the other districts of Rayalseema. The hills above this elevation are not of any great size, and they are not given any definite generally accepted names, except that local names like Yerrakonda, Nallakonda, etc,. are given for certain peaks. There are five regions where the hills are grouped together to form low ranges.

1. *Muchukota Range.*—This range of hills, called after the Muchukota or Mutsukota reserve forest runs between Tadpatri taluk on the one side and Gooty and Anantapur on the other. Starting from the north of Gooty they run south for a distance of about 35 miles. At about their southern end the river Chitravati crosses the hills at right angles by a deep and narrow gorge. The river at this point is of considerable dimensions having received a few tributaries after leaving the Dharmavaram tank. This range is so high and rocky that there are only two roads crossing it, *viz.*, those that connect Tadpatri with Anantapur and Gooty. Many hills on this range are made up of rocks which

geologically belong to the Cuddapah system. There are found among the sedimentary rocks contemporaneous traps which can be traced into the Kurnool district in the north-east.

2. *Nagasamudram Hills.*—This range is not well-marked as the previous one. The hills start from the middle of Gooty taluk and run due south through the western portions of Anantapur and Dharmavaram taluks. There are numerous gaps in the range. The hills decrease in height as we pass south; but in the extreme south the Kondapalli hill, which is 2,255 feet forms an exception. The total length of the range is slightly more than fifty miles, while it is never broader than five miles.

3. *Mallappakonda Range.*—In the eastern half of the Penukonda taluk is a confused range of hills. They have no fixed direction. These hills may be considered to form a natural boundary dividing the Penukonda and Kadiri taluks. A north-eastern wing runs to the town of Dharmavaram. A number of small streams have their source among these hills; and these streams join the Chitravati directly or fall into the Maddaleru river. This range is named after its highest point Mallappakonda 3,088 feet above sea level, (lat. 14°-15' long. 77°-50'). The range runs further south into the Mysore State.

4. *Penukonda Range.*—This range starts from the south of Dharmavaram taluk and runs almost due south. It passes Penukonda and Hindupur taluks and enters the Mysore State. The hills form a very confused range with a number of breaks, the most important being just north of Penukonda town.

Cuddappah system already mentioned) belong to the Archaean system. The rocks are all gneisses of different kinds with intrusions amidst them of dykes and traps. Remarkably long dykes running for 40 and 50 miles have also been observed in the central position of the district. But as all this is worked out in full in the Paper on the Geology of the district, no account of it is attempted to be given here.

PEAKS OF OVER 2000 FEET ARE NOTED BELOW.

		Name of Peak.	Ht. in feet.	Approximate lat. and long.	
Gooty	1.	Boglemarkonda	2346	15° 5′	77° 30′
	2.	Gooty	2105	15° 8′	77° 38′
Kalyandrug	3.	Devadelabetta (within a mile of Kalyandrug)	2430	14° 34′	77° 5′
	4.	Palvoi hill	2615	14° 29′	77° 10′
	5.	Kondarpidurga	2992	14° 18′	77° 2′
Anantapur	6.	Gumpmal	2506	14° 50′	77° 40′
Dharmavaram	7.	Avuladevarakonda	2321	14° 35′	77° 42′
	8.	Uravakonda	2189	14° 15′	77° 35′
Penukonda	9.	Mallappakonda	3088	14° 15′	77° 47′
	10.	Penukonda	3088	14° 5′	77° 35′
	11.	Bommasandra	2005	13° 58′	77° 29′
Kadiri	12.	Pipad	2285	14° 20′	78° 8′
	13.	Innaglur	2895	14° 2′	78° 5′
Madakasira	14.	Muthukuru	2650	13° 55′	77° 2′
	15.	Muthanahalli	3349	13° 55′	77° 6′
	16.	Madakasira hill	2934	13° 56′	77° 15′
	17.	Rollabetta hill	3247	13° 50′	77° 7′
Hindupur	18.	Yerrakonda	2817	13° 54′	77° 37′
	19.	[illegible]	2673	13° 20′	77° 48′

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5. *Madakasira Hills.*—The Madakasira taluk is roughly divided into a northern and a southern portion by a group of hills. These hills of this taluk differ from those in the other taluks that they support good vegetation and they are more a series of high peaks than a range of hills.

While these five ranges of hills mentioned above can be made out, the district has also a large number of detached hills and solitary peaks rising up from the high plains. These hills are, on the whole, more or less level-topped rather than rising into peaks.

In the north-western corner of the district rocks of the Dharwar system of Indian geology have been observed. The rocks of all other places (excepting those belonging to the

Cuddappah system already mentioned) belong to the Archaean system. The rocks are all gneisses of different kinds with intrusions amidst them of dykes and traps. Remarkably long dykes running for 40 and 50 miles have also been observed in the central position of the district. But as all this is worked out in full in the Paper on the Geology of the district, no account of it is attempted to be given here.

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	19.	Kudikonda	2673	13° 20′	77° 48′

Geology of the Anantapur District

By

Mr. V. D. Krishnaswami, M.A.

Morphology. The District of Anantapur may be divided transversely into three zones showing distinct physiographical features.

1. The southern taluks of Penukonda, Madakasira, Hindupur, and Kadiri. The portion included in the above parts is the most elevated and hilly part of the district. The country is fertile and is dotted with woods.

2. The central taluks of Anantapur, Kalyandrug and Dharmavaram. The scenery in these areas becomes more stern and bare, the greater part being a plain land. The country here is barren and desolate looking.

3. The northern taluks, comprising the Gooty and Tadpatri taluks, partake the characteristics of 1 and 2. The eastern portion is hilly but with no high peaks. The central and the western parts contain wide stretches of black cotton soil. The eastern part is the most fertile in the district. The Penner flows through the middle of the central plains.

1. The entire area covered under the southern and central taluks is divided by longitudinal parallel ranges with north-south strike, the most prominent of them being in order from west to east—(a) *Ratnagiri Madakasira granite running north from the Mysore territory to Kalyandrug* where the continuity is interrupted by several breaks, (*b*) Palasamudram-Penukonda-Mustikovila granite range with the unique Ramgiri Dharwar schist band. This range bifurcates itself into two ranges at Ramgiri, the two running on either side of Anantapur. The Tadakeleru and its tributary Pandameru rise in the northerly branch of this range and flow respectively into the Singanamalla and Anantapur tanks, and (*c*) the Mallappakonda range. It begins at Dharmavaram town and runs out of the district into the Mysore State, standing as a barrier all along between Kadiri and Penukonda. In the low country between (*a*) and (*b*) flows the Penner and between (*b*) and (*c*) drains the Chitravathi river, the feeder for the big lakes of Bukkapatnam and Dharmavaram and the tributary of Penner. The Maddaleru, a feeder of the Chitravathi, rises in the Mallappa-

konda range towards the Kadiri taluk and joins the main stream in the Dharmavaram taluk.

Madakasira is hilly and rocky towards the centre and the south but to the west more level. The highest peaks are Ratnagiri and Madakasira. The western side is more fertile and is aided by a better supply of water through many tanks and rivulets that ramify the taluk and drain into the Hagari. This is the most favoured region of the district standing as it does at a higher elevation receiving an ampler rainfall and possessing a red soil of superior fertility and thicker vegetation. All these natural advantages have led to the taluk as a whole being described as "the Garden of the district." Hindupur is in the main flat and is similar to Madakasira in point of natural advantages. Penukonda is very hilly as the very name indicates and contains detached dome shaped hills as well as clusters of them. The principal clusters are those at Palasamudram and Penukonda, the highest point here being 3091′ above sea level. Kadiri is very stony and barren and is cut up by detached rocky hills which are destitute of vegetation. The Maddaleru rises in and passes through the taluk and the Papaghni passes through its southern and south-eastern portions. The soil is of poor, coarse red earth mixed with disintegrated granite. Black cotton soil is however met with in patches here and there.

The undulating plains between the hill ranges of (*a*), (*b*) and (c) are always composed of the Archaean gneisses and their in situ weathered products, either regur or laterite. It is through the gneisses that the granitic hill ranges have intruded. Nowhere the rivers are much utilised for irrigation. Both Penner and Chitravathi traverse the Penukonda and Hindupur taluks in the same direction.

2. The tract of country in the central taluks is mostly plain land, leaving out the interrupted continuations of (*a*), (*b*) and (c) ranges mentioned in the southern taluks. Besides these, there are numerous examples of isolated peaks and rocky clusters, like the precipitous Kundurpidrug, the cluster roundabout Kalyandrug and the fine group north of Singanamalla tank and the hills just north of Malayavantam in the Anantapur taluk. The highest point in the Malayavantam group is Gampamalla hill 2510′ above the sea. The soil in the main is gravelly and of the poorest nature, being lateritic. The soil in the north of the Anantapur taluk towards Penner is black cotton. There is scarcely any vegetation, the country is barren and desolate looking. The large tank of Bukkarayasamudram at Anantapur taluk is fed by the Pandameru river. Dharmavaram is hilly on the three sides except the

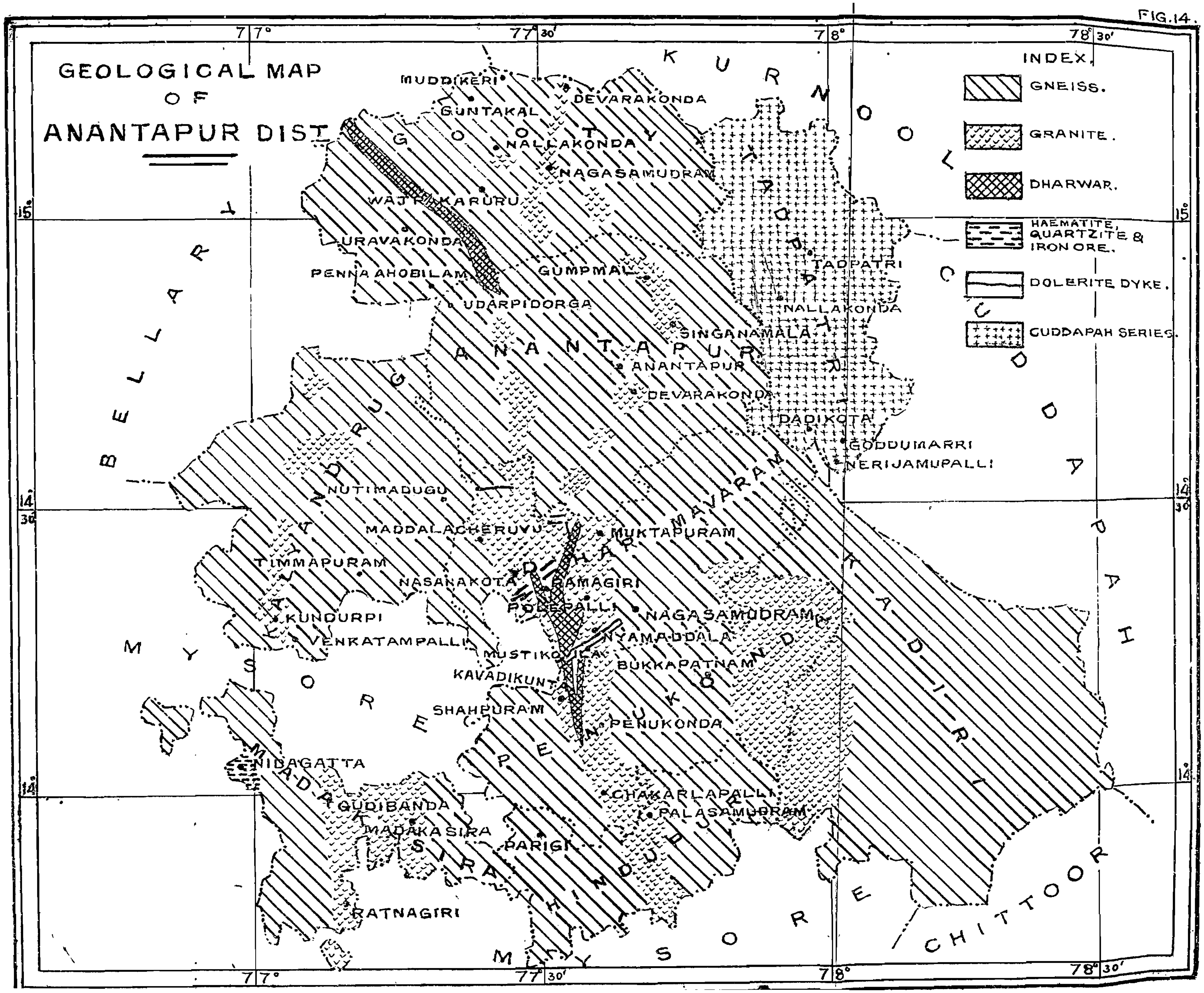
north, the soil is chiefly lateritic and there is little black soil. The only large tank at Dharmavaram has been formed by damming up the Chitravathi river. Here gold mining was once a thriving industry round Venkatampalli and Rampuram.

3. The northern part comprises Gooty and Tadpatri taluks. This region is drained by the Penner in a west to east direction. The eastern side as a whole is hilly towards Cuddapah. Along the eastern side of the Tadpatri taluk runs a portion of the Errakonda range of Kurnool. In the north between Tadpatri taluk on the one side and Gooty and Anantapur on the other runs the Muchukota range. It travels right across that part of the district from north of Gooty town down to the Chitravathi river which crosses the range at right angles and is some 35 miles in length and as broad as 7 miles in some places.

The north-eastern portion—Tadpatri—is an open plain. On either side of the river are wide stretches of black cotton soil, the most fertile in the district. There is hardly any laterite in the taluk. The greater part of the Gooty taluk is continuous with the black cotton soil region of Bellary. A number of detached rocky hills like Nallakonda, Devarakonda and Namellakonda are composed of a porphyritic syenite. A very hard handsome red micaceous granite forms the group of hills near Nagasamudram. The black cotton soil of the Gooty taluk in the west is fertile; but the soil in the north and east is red and gravelly. Wajrakarur is an important village in this taluk noted for diamonds. Diamonds are frequently picked up by the villages in the fields after rains. Some years back a stone was picked up which when cut and polished was valued at upwards of £ 10,000.

Orographical Elements. In studying about the physiography of the district as a whole, a note on the origin of the hill ranges may be made. The mountains that we see in our locality are all chiselled out of a plateau of erosion. Being at a higher elevation, it is subject to more active and intense erosion. Further, the prominent features of the land largely depends upon the lithological character and the geological structure of the underlying rock masses. The Deccan Plateau has not been subject to crustal deformation since the close of the Vindhyan era, an enormous lapse of time quite sufficient for the ever-active agents of erosion (the epigene forces) to show their activities. This alone would have been enough to account for the excessive denudation of the consequent furrowing and trenching into valleys and spurs. The original table land character is now hardly recognisable and

FIG. 14.


GEOLOGICAL MAP OF ANANTAPUR DIST.
INDEX.
GNEISS.
GRANITE.
DHARWAR.
HAEMATITE, QUARTZITE & IRON ORE.
DOLERITE DYKE.
CUDDAPAH SERIES.
KURNOOL
CUDDAPAH
BELLARY
MYSORE
CHITTOOR
GOOTY
TADPATRI
ANANTAPUR
DHARMAVARAM
KADIRI
PENUKONDA
HINDUPUR
MADAKASIRA
KALYANDRUG
MUDDIKERI
GUNTAKAL
DEVARAKONDA
NALLAKONDA
NAGASAMUDRAM
WAJRAKARURU
URAVAKONDA
PENNA AHOBILAM
GUMPMAL
UDARPIDORGA
SINGANAMALA
ANANTAPUR
DEVARAKONDA
DADIKOTA
GODDUMARRI
NERIJAMUPALLI
NUTIMADUGU
MADDALACHERUVU
MUKTAPURAM
TIMMAPURAM
NASANAKOTA
RAMAGIRI
PODEPALLI
NAGASAMUDRAM
KUNDURPI
VENKATAMPALLI
NYAMADDALA
MUSTIKOVILA
BUKKAPATNAM
KAVADIKUNTA
SHAHPURAM
PENUKONDA
NIDAGATTA
CHAKARLAPALLI
PALASAMUDRAM
GUDIBANDA
MADAKASIRA
PARIGI
RATNAGIRI
77°
77° 30'
78°
78° 30'
15°
14° 30'
14°

the country as a whole has been converted into rolling uplands, into regular or irregular groups and masses of relict mountains, largely determined by the nature of the constituent rocks and the mode of their arrangement. The rocks of the valleys and plains in the district are all foliated gneisses into which are intruded dykes of granite, diorites and dolerites. The gneisses being the softer are easily accessible to weathering agencies and are pulled down. The intruded rocks—here granitic and doleritic—stand out as square-cut and steep-sided hills, being harder than gneisses. They show no axis of tectonic upheaval coincident with their present north-south strike in our district. What we at present see of them are but the deeply eroded remnants of the original plateau. Hence the hills of our area are typical of heights which have been moulded by epigene forces of weathering and may be truly styled as mountains of circumdenudation, i.e., they are the outstanding remnants or outlines of the old plateau of the Peninsula that have escaped the denudation of ages. Mountains of this kind are termed 'Subsequent or Relict type.' The hills of the district as well as the mountains of the whole Peninsula are examples of the Relict type.

Stratigraphy & Lithology

THE FORMATIONS AND ROCK GROUPS WHICH ENTER INTO THE GEOLOGY OF THE ANANTAPUR DISRICT ARE : —

<table>
<tr><td>Pleistocene—Recent.</td><td colspan="2">Regur and laterite, the decomposition products of the gneisses that give rise to residual soils.</td><td></td></tr>
<tr><td>Purana—Cuddapahs.</td><td colspan="2">The Papaghni Series of the Tadpatri taluk composed of sandstones, shales and slates with dykes and sills of contemporaneous lava flows.</td><td rowspan="4">UNFOSSILIFEROUS.</td></tr>
<tr><td>— — — — — —</td><td colspan="2">EPARCHAEAN UNCONCORMITY</td></tr>
<tr><td rowspan="2">Archaean</td><td>Dharwars</td><td>Penner-Hagariband
Ramgiri-Penukonda Schist.
— — — — — — — — — —</td></tr>
<tr><td colspan="2">The Archaean gneisses intruded by pink pistacite granite, both are traversed by dolerites and quartz reefs.</td></tr>
</table>

The Mysore Geological Department and the Geological Survey of India, surveyed the entire district, the former the southern portion south of lat 14°.30′ N. and the latter the northern part north of that latitude.

The crystalline and the gneissic rocks of the Archaean fundamental complex constitute the first and the oldest group and cover by far the largest area of the district. The rocks show a considerable variety of texture and composition. In the northern part of the Gooty taluk a porphyritic syenite forms a number of rocky hills like Nallakonda, Devarakonda and Namallakonda. A band of the same kind stretches southwards down to and beyond the Penner. A very handsome red micaceous granite forms the group of hills near Nagasamudram of the same taluk. In the Anantapur and Kalyandrug taluks by far the greatest part of the gneissic area is occupied by highly granitoid rocks which are also far more conspicuous than the well foliated gneisses. The gneisses are generally very little seen owing to the continuous sheets of regur which mantle them. Even the few outcrops of the gneiss within the area of regur are in too advanced a state of decomposition to allow anything but the roughest determination of their nature. Pink granitic gneiss is characteristic around Muddikeri, a few miles north-east of Guntakkal Station. The remarkable accessory mineral here is Pistacite. The rocks here have undergone considerable metamorphism so that they are often very hard to distinguish from veins of younger intruded granite. The porphyritic granite gneiss so largely developed to the westward of the Penner-Hagari band of Dharwar rocks, which traverses the Gooty taluk constitutes the typical 'Bellary Gneiss.' Pistacite is less common here. The colour of this fresh rock is purplish. The prevalent feldspar is a pink orthoclase. A variety of schistose gneiss is developed to some extent in the valley of Penner and to the south and east of Wajrakarur.

The geological features of the southern half of Anantapur comprised under the taluks of Kalyandrug, Anantapur, Dharmavaram, Penukonda Madakasira, Hindupur and Kadiri may be treated under the following heads as it has been done by the Mysore Geological Department on account of definite changes in the constitution of the rocks from west to east.

1. The Ratnagiri-Madakasira Range,
2. The plains west of this range,
3. The plains to the east of this range,

4. The Penukonda-Ramgiri Range,
5. The Penukonda-Ramgiri Schist belt,
6. The gneissic low country to the east of No. 4.
7. The Mallappakonda Range,
8. The Maddaleru basin enclosed between No. 7 and Seshachalam Hills to the east of the Kadiri Taluk.

1. The average width of this range is 10 miles. The hills in the eastern part of this range are composed of a pink granite, fairly coarse in texture and somewhat porphyritic. Intruded through this are various dykes and veins of fine grained purplish granite. The valleys between the peaks when not covered down by rainwash frequently show the foliated gneiss which flank the eastern and western borders. In the northern part of this range, a great number of doleritic dykes cross the country at right angles. The dykes are however absent in the Madakasira taluks.

2. The plains to the west of Number 1 (west of Madakasira) are entirely gneissic. At Nidaghetta there is a large Quartz Haematite schist resting on the gneiss.

3. The plains to the east of No. 1 which are drained by the Penner (western portion of Hindupur and Penukonda) are composed of much metamorphosed and banded gneiss. The gneiss throughout this north-south strip of plain country contains a large number of thin runs hornblende and schist dipping and striking parallel to the gneiss. The whole country is intersected by micro-granitic veins and pegmatites. Towards the north, near Somavandlapalli in the Dharmavaram taluk doleritic dykes are very abundant.

4. The Penukonda-Ramgiri Range is also a huge granitic intrusion. The highest point culminates in the Nundydrug Hill of Mysore State. The boundary of this intrusion is very irregular and it is difficult to distinguish the mottled granite at its edges from the foliated gneiss which flanks it. The other important peaks of this range are Kavadi Konda and Nasankote. A great variety of rocks exist in this range. The granite is pinkish, of fine grain and contains a large number of included gneiss. The variation becomes more pronounced at Nasankote where the granites and diorites are noticeable together. The outcrop of this range at the Kalyandrug-Dharmavaram road is distinctly of a dioritic type. All these varieties of granite contain the green mineral epidote. Further, the range is traversed by east-west

doleritic dykes running for several miles in a parallel manner and forming a capping to all the peaks. They are all so regular that they cause the range to appear to be running east to west whereas in reality the actual run of the granite is north to south. In this locality the dolerites are much harder than the granites which they intrude into.

5. The Penukonda-Ramgiri Schist Belt. This division contains essentially the Dharwar Schist Band intruded by tapering runs of granite with broader portions to the north. This is better described under the Dharwars of the district.

6. The parts of Hindupur and Penukonda lying in this low country is chiefly made up of mylonitic gneiss with lateritic caps in the south. Through this territory flows the Chitravathi river. The eastern portion is bordered by the confused range of Mallappa Konda (No. 7) formed essentially of granite gneiss with minor intrusions of pink granite.

8. The area enclosed between the Seshachalam Hills and No. 7 forms the Kadiri taluk and the country as a whole drains into the Maddaleru. The prevalent rock is the gneiss with intrusions of granite that form the detached rocky hills. A small amount of Dharwar Schist occurs in the form of long strings. Haematite is confined to these strings and was used in olden times to be smelted by the primitive native processes.

Dharwar Rocks. Rocks of this system are very varied in kind but schistose varieties predominate and give a marked character to all the tracts they occupy. Another peculiarity regarding their mode of occurrence is that they occur on narrow elongated synclines as outlines in the Archaean gneiss; consequently they received a great deal of compression and are preserved in the synclinal troughs.

Of the eight Dharwar bands so far recognised the Penner-Hagari band is the one that enters into the north-west corner of the Gooty taluk from Bellary. After crossing the Bellary territory, it runs nearly south-east for 24 miles towards Penner, where it trends south and south by west for 22 miles; beyond this it was not mapped. To the east and south-east of the point where it crosses the Penner are a number of outliers of Dharwars which represent so many parts of foldings which have been caught down into small faults in the Archaeans. There might have been a connection between this band and the Penukonda-Ramgiri Schist belt.

The nature of the rocks forming the Penner-Hagari band is chloritic schists of dark green colour. The schists are highly metamorphosed and traversed by large dykes of greenish diorites. The boundaries are everywhere concealed by black cotton soil. Too little of this band is exposed in the Gooty taluk to enable one to explain the position it occupies with reference to the underlying gneiss. Near the Penner it certainly appears to hold the position of a synclinal fold sunk in the gneissic rocks, the beds composing it being tilted up vertically in parts and generally showing very high angles of dip.

The next important band is that mentioned under item 5. This is known as the Penukonda-Ramgiri band intruded by tapering runs of granite. The schist belt commences close to the village of Chakarlapalli in the Penukonda Taluk and goes up to the Dharmavaram-Kalyandrug road, a distance of over 30 miles varying in width from half a mile in the extreme south to 4 miles at Mushtikovila.

It has a central direction of 10° west of north. The eastern border is much branched due to peg-shaped intrusions of granite. The main mass of the schist belt consists of a black fissile fine-grained hornblendic rock forming one half of the eastern side of the main mass and the whole of the easterly branch of Devarakonda (Penukonda Taluk). The western portion is composed of argillites. Chlorite schist is almost wanting south of Mushtikovila but forms the most prominent rock of the thin branch west of Ramgiri. Haematite quartzites form several well-marked bands in the schist, east of Ramgiri and near Polepalli. Limestone and calcareous schist are present as irregular thin runs between hornblende schist and fissile argillites. On the high ranges west of Ramgiri, the schists alternate with white quartzites.

The rocks of the schist belt appear to be of two distinct ages; the chief reason for assuming this is that the east-west dolerite dykes which invariably penetrate the hornblende schist and the haematite quartzite are never continuous into and across the argillites. The beds constituting the belt are folded into several sharp anti- and synclinals but no continued repetition of beds outside the limit of each synclinal fold was observable. Mr. E. W. Wetherell, the the Mysore State Geologist, in writing the report in 1905 on this belt expressed as follows:—"The general appearance of the whole country would point to the schist at present existent as a remnant of a much larger belt which has been intruded by

granite, which is now found occupying the eastern and western borders of the whole belt and as intrusions through it."

Intrusive Rocks. These form an important feature in the landscape of many parts of Anantapur and cannot be overlooked in a brief description of its geology. They are of two classes .1. Trappean and 2 Granitic. The latter is in all probability the older. The granitic intrusions have been widely treated in the discussion on gneisses. The principal seat of occurrence for them is in the rocky hills lying west of Gooty. The granite gneiss is cut up by red pistacite granite in very irregular veins of all sizes.

The trappean dykes are of very common occurrence and traverse all kinds of rocks—the gneisses, the intruded granite and the Dharwar schists.

Quartz reefs, the super-acid phases of granites and pegmatites are very common in the neighbourhood of Anantapur and Gooty. Two very conspicuous reefs form the crests of Tellakonda and Ragulpad ridges near Wajrakarur.

The Tuff Agglomerate at Wajrakarur-Gooty taluk.—This is a remarkable formation of agglomerate tuff in a 'neck' piercing the epidotic granite lying west of Karur. The neck is of considerable size and covers an area of several acres but is much obscured by the gneissic debris. This is the locality where diamonds are picked up by the villagers in the fields after rains. Though the nature of the agglomerate tuff is similar in character to the Kimberley blue ground, no trace of carbon has been found here and the question whence the diamonds of this locality came from will ever remain a mystery. The age of this tuff is fixed in the Dharwar times when violent volcanic eruptions and tectonic distrubances took place.

The Cuddappah System. The north-eastern part of the district, covering the entire Tadpatri taluk is occupied by the deposits of the above system. The rocks rest with a great unconformity on the Archaean gneisses of this taluk and carry the lower groups of this system which make a great semicircular band extending from north-west and north from Kurnool to Cuddappah. The Muchukota range forms the westerly limit of the cuddappahs; and the succession of formations occurring here agrees with that seen in the Pulivendla taluk of Cuddappah. The rocks are mainly composed of sandstones followed by slates and shales with a few limestone layers in the shales. Contempora-

neous lava flows in the form of dykes and sills had metamorphosed the limestones into marbles, talc and serpentines. Besides they contain banded cherts and jaspers which are often picked up in the river gravels of Chitravathi and Penner. The rocks possess low angles of dip and therefore were free from voilent volcanic disturbances that characterised the Dharwars. Five miles N. E. of Tadpatri, there is a small tract of Banganapalle quartzite capped by *Narji limestone* (of the Jamalmadugu group—Kurnool system), which is of interest as being the most southerly point at which the diamond beds occur. No mining operations seem to have been attempted here.

Pleistocene Deposits. The sub-aerial formation of this age are laterite, regur, the sand dunes on the banks of Penner near Tadpatri and the travertine rocks of the Kona-Uppalapadu Valley. Laterite and regur are the residual soils got by the disintegration of gneisses and schists *in situ.* Regur or black cotton soil is a highly argillaceous fine-grained soil with calcium and magnesium carbonates and a very large admixture of organic matter. The dark colour of the soil is attributed to the organic matter. The soil is credited with an extraordinary degree of fertility. It is extremely sticky when wetted. Laterite is red in colour and vesicular in structure and rich in iron and aluminous oxides. The origin of regur is ascribed to long continued weathering of feldspathic gneisses of an area, which would result in a clayey residue and which by impregnation of decomposed organic matter resulting from jungle growth over it could assume the character of regur.

Sand Dunes. To the west of Tadpatri town are a series of dunes, some of which are as much as 60 feet in height. The sand has been blown out of the river bed by the strong winds of the south-west monsoon blowing through the valley during the hot weather months. These have encroached upon and ruined the wet land adjoining.

Travertine. At the mouth of the valley in the Erramala hills, near Yadiki is an overhanging cliff. Underneath this runs one of the perennial springs which passing over a series of small ledges of rock forms a little waterfall (*kona*). The cliffs in this place are an interesting example of recent travertine deposited on the scarp of older rocks by the perennial streams flowing from a more elevated plateau of the *Kurnool Limestone.* The travertine caves carved in these cliffs are studded with numerous stalactites. Fresh water shells and leaves of existing species have been en-

countered by travertine and their impressions are well-preserved. The lime dug out from this is particularly white and soft and much used for building purposes.

General Geological History. The oldest Archaean gneisses, have been designated as the 'fundamental gneisses' as they form the basement for all the later rocks. The gneisses are extremely folded and metamorphosed, and intruded by granitic and doleritic dykes. In field relations the gneiss differs from ordinary instrusive granite only in the enormous area which it occupies. The texture of the rocks vary widely, from a coarse holocrystalline rock to a *felsite* with a texture so fine that they appear quite homogeneous to the eye. The gneiss is believed to be to some extent the first formed crust of the earth by the consolidation of the molten globe. Though the Archaean rocks are classified into well-defined groups, they do not represent any definite succession in time.

The Dharwar Schistose rock, like the argillites, phyllites, seen in the Penner-Hagari band and the Ramgiri-Penukonda schist band, had been formed from the earliest sediments, yielded by the weathering of the older Archaean gneisses. Their sedimentary nature has been completely obliterated by the great degree of metamorphism induced by the tectonic disturbances that marked the close of the Dharwar era. The hornblendic and the chloritic schists are held to be the metmorphosed basic lava flows of these times. The real origin and correlation of the Dharwars to the Archaean gneisses are still unsettled questions.

The formation of the Cuddapah rocks discloses the presence of a sea in the Cuddapah area where sedimentation was going on, the material for which had been derived from the waste of the Dharwar land caused by epigene forces. It is on the deeply denuded edges of the Dharwars and the Archaean gneisses that the basement strata of the Cuddapahs rest with unconfirmity. The Cuddapah rocks have in general low angles of dip and enormous thickness of sediments. These conditions indicate the absence of any violent tectonic disturbance since Post-Dharwar times and a slow and quiet submergence of the basis of sedimentation as fast as they were filled.

Since the close of the Vindhyan era, succeeding the Cuddapahs, sedimentation had ceased and the great *epirogenic* uplift at the close lifted the entire peninsula from the present day. This is the reason why no fossiliferous younger formations were

not recorded in the peninsula, more particularly in the Deccan Plateau.

Economic Geology. Anantapur district cannot be regarded as richly endowed with deposits of great commercial value. Many important industries like gold-mining, diamond-mining and iron ore-mining have all become defunct. Nevertheless the country possesses potenial sources of wealth in its building stones, steatite and barytes. These are the principal economic materials and along with gold and diamond are treated below.

Building Stones are distributed throughout the district in great profusion and variety and many of them are suitable for the best class of architectural and decorative work. The pink pistacite granite near Gooty is a valuable building stone and has in the past contributed material of excellent quality for the buildings of numerous temples and other edifices of South India and even in the fortress at Gooty.

Barytes occur in veins, the largest of which is from 3′ to 11′ wide in the Vaimpalle slates and limestones belonging to the Papaghni Series of the lower Cuddapahs near Nerijamupalle. Another outcrop occurs in the Dadikota reserve forest near Nerijamupalle, Tadpatri taluk. The colour of the Barytes is generally white, varying to light green and faint pink. The deposits are not worked because of the absence of any demand for the mineral.

Steatite or Talc occurs in the Gulmari Village, Tadpatri taluk; also found at Goddumari in the same taluk along with serpentinous limestone. The colour is yellowish white and greenish, structure compact and cuts easily in slices. This is a good serviceable stone and gives a fair lubricating powder. This is also carved into bowls, plates and vases at Rayalcheruvu.

Corundum is reported to occur at Parige near Hindupur; in several places in Madakasira taluk; at Siddarampuram, Atmakuru and Timmapuram in Anantapur Taluk; at Maddalacheruvu and Sivapuram in Dharmavaram; and at Nutimadugu, Manirevu in Kalyandrug. In all these places the corundum occurs *in situ* in the coarse grained gneisses in small round grains and in large crystals measuring some inches in size. It is only mined spasmodically and on a very small scale.

Haematite. The haematite quartzites occurring in the Dharwar Schists were once exploited to be converted into iron by charcoal fuel got from the forests. This industry is nearly extinct

but still lingers at Kamalapuram (Bellary). This charcoal iron industry may revive, if the forest conservancy energetically succeed in re-afforesting the depleted forests and reduce the price of charcoal.

Limestone is seen to occur in a layer 3 feet below the regur soil in the Gooty and Tadpatri taluks. This is highly concretionary and kunkarous. When quarried it is white and soft and is in great demand for local building purposes.

Diamonds. Although no statistics are available, private reports indicate that every year a certain number of valuable diamonds are picked up after showers of rain in the neighbourhood of Wajrakarur, in the Gooty taluk. The neck of agglomerated tuff has been thoroughly bored and tested for probable origin of diamonds but the results were highly disappointing and do not show any indication of origin.

Gold occurs in the quartz reefs that traverse the Dharwar Schist in the Ramgiri-Penukonda Schist belt. Near the village of Ramgiri are found old gold workings. The gold is essentially seen in those quartz veins traversing chloritic and argillaceous schists. Company after company was floated since 1905 and all mining operations were ceased in 1924. The mines were all situated in the Dharmavaram taluk. The villages where gold was extracted in this taluk are Rampuram and Venkatampalli. During the quinquennium 1919-23 44,678 ounces of fine gold were produced. Ancient gold workings were discovered in the Gooty taluk also. After 3 years of work since 1925 mining operations were permanently suspended. The total amount produced from Anantapur in the last quinquennium 1924-1928 was 7,259 ounces.

Cuddapah slabs are quarried from the Tadpatri taluk and are mainly used as flooring slabs. This is a shaly limestone.

Slates are reported to occur in the Tadpatri taluk and are remarkable for their size, smoothness and fissility. They find a market in the form of Madras writing slates. They were exhibited in the industrial exhibition of last year attached to the Park Fair.

Soils. The soils of Anantapur form by far the most unimportant economic deposit. They are essentially composed of black cotton soil, the weathered products of the Feldspathic Archaean gneisses. In the northern taluks of Tadpatri and Gooty, the black cotton soil is highly fertile. The central tract is the least

fertile and is composed of red loamy soil. The southern taluks are the most fertile of the district, the soil is composed of either laterite or regur in patches. The fertility is due not entirely to the soil but to the peculiar coincidence of climatic conditions and physiographic features. The laterite cap is everywhere infertile. The black cotton soil is not used for any wet cultivation. Its inferiority is attributable to its salinity and to its water clogging nature during the monsoon times.

Conclusion. In closing this sketch of Anantapur Geology certain facts have to be borne in mind. Firstly the area under consideration, in the words of Mr. W. Francis is "neither a geographical, historical nor ethnical entity but the product of administrative convenience and its accidents." The most recent of these is the addition of the Kadiri taluk from out of the Cuddapah district, an act which adds nothing to its homogeneity."

The geography of the district forms part and parcel of the entire Deccan Plateau region. A back sight from the Anantapur District towards the south in the Mysore Plateau exemplifies in a remarkable manner, the longitudinal continuation of the various hill ranges mentioned under the southern taluks. In the central taluks of the district their continuity is interrupted and their central north-south direction becomes altered. But for a look on the map (Sheet No. 57 and 66 of the Survey of India) one is apt to fail to obtain a true perspective of the hill ranges.

The rock formations are simple and few; but their field relations have evoked interesting questions on their mode of occurrence and origin. Diverse are the views formed by many geologists about them, but none of them is to be taken as the last word but have to be accepted as partial truths throwing light in the contexts in which they occur.

The names of hills possess a legendary interest about them. They are either suggestive of historical facts or based on the colour of rocks forming the hills. A few examples of the latter kind are—Nalla konda, Tella konda and Erramala. From the names alone we can obtain roughly an idea of the nature of the rocks. Nallakonda brings into one's mind the dolerite dykes so common in our area, the word Tellakonda that of quartzites and lastly Erramala that of laterite.

Lastly, inasmuch as the waters of the rivers are not perennial and the monsoons bring in but a meagre supply of rainfall, the soils of the various parts of the district should be studied with

a view to their capacity for retaining good underground water currents. The Government is doing this work in right earnest to supply the people with good water through wells. It is a matter of experience that environment brings into play certain traits in men which in other circumstances would lie dormant or entirely wanting. During summer times, the people are forced to dig out deep trenches along the hill streams and nullahs to reach the perennial underground water currents in certain localities and thereby relieve their water necessity to some extent. In writing this paper, it has come to my notice that a band of well diviners are obtaining employment in this district to divine the water current underground for which they expect to be paid before-hand whether the parties succeed or not at the particular points they fix. Instead, if a thorough research of the soils from this view-point is made by competent and practical geologists, it will yield better results that are open to scientific examination.

The Meteorology of Anantapur

BY

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The district of Anantapur was formerly a part of the Bellary district from which it was separated in the year 1882 and hence it is not a geographical unit. It is bounded on the east, north-west and south by Cuddapah, Kurnool Bellary and Chittoor districts respectively and on the south and part of the west by the Mysore State. The district is made up of nine taluks. Gooty and Tadpatri in the north, contain large areas of black cotton soil; Anantapur, Kalyandrug, Dharmavaram and Penukonda in the middle and Kadiri in the south-east are mainly made up of arid expanses of poor red soil without much vegetation; Madakasira and Hindupur in the south which are connected with the Mysore plateau and stand at a higher elevation than the rest of the district are more fertile than the others. The district on the whole is mostly barren and there are no hills of any great size. The level of the district has a gradual fall from the south up to the valley of the Penner in Gooty and Tadpatri taluks, after which it rises slightly once more. In Hindupur and Madakasira, the average elevation is above 2000 feet. Anantapur and Gooty stand at about 1100 feet while Tadpatri is only 900 feet above mean sea level.

Since no systematic meteorological observations are made in the district, we have no official records of the pressure, the temperature, the humidity, and the direction and velocity of wind in this part of the country. But the climate closely resembles that of the neighbouring district of Bellary.

The three hottest months in the year are March, April and May during which the average maximum temperature is between 99° and 104°F, and the average minimum between 71° and 78°F. In June, after the onset of the south-west monsoon, the maximum drops drown by five or six degrees and then decreases slowly every month until December when it registers about 85°F. The average minimum also decreases gradually to about 61°F. Madakasira and Hindupur, due to their higher altitudes, are the coolest of the nine taluks.

During the south-west monsoon, from June to August, very strong winds blow over the district from the south-west. In August and September, the wind turns round to the north-west. In October and November, the wind is from the north-east. From December to March, there is light south-east wind.

Anantapur is one of the dry districts in the presidency. The average annual fall is about 27 inches. Though the district lies midway between the two monsoons, it does not derive the benefit of either. As it is too close to the Western Ghats it does not receive much rain during the south-west monsoon and the north-east monsoon current leaves behind most of its moisture before reaching the district. There are three distinct rainfall zones in the district. Anantapur, Dharmavaram and Kalyandrug in the centre are the three driest taluks; more rain is received in Gooty and Tadpatri; the taluks in the south receive the largest amount of rain.

From December to March there is practically very little rain, the average then received being less than one inch; in April and May, there are a few showers; with the onset of the south-west monsoon in June and July, much rain is received till the end of the north-east monsoon in November. The heaviest fall is during September. The total number of rainy days in a year is 103, while that of Bellary, Kurnool and Cuddapah are 84, 135 and 157 respectvely. The heaviest fall on record was in 1874 when 38.6 inches of rain was received. The lightest was in 1876 when the average fall was only 6.9 inches. According to Williamson and Clark, Anantapur lies within the zone, where the variability of rainfall is from 25 to 30%; and this high percentage of variability shows that rainfall is very uncertain in this district.

Fig. 1. The maximum temperature is reached during April in Anantapur and Bellary, while in Cuddapah and Kurnool during May. The highest maximum is recorded at Cuddapah and the lowest at Anantapur and Bellary. In all the four places, there is a sudden drop in the maximum during June and July, and October and November, showing the effect of the monsoons. In October, there is a slight rise in the maximum at Kurnool. The lowest maximum for the four stations is during December and of all these the maximum at Anantapur is the lowest. From January to May, the maximum at Anantapur is the lowest. From May to July, the maximum at Bellary is the lowest. From July to October, the the maximum at Kurnool is the lowest. From October to December

Fig. 1. (15)

MONTHLY MARCH OF MAXIMUM TEMPERATURE

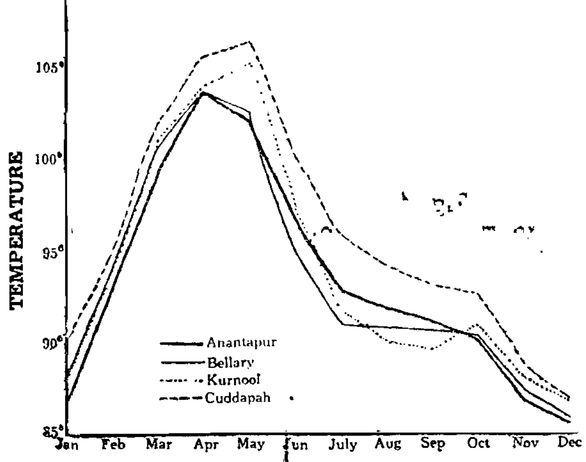


Fig. 2. (16)

MONTHLY MARCH OF MINIMUM TEMPERATURE

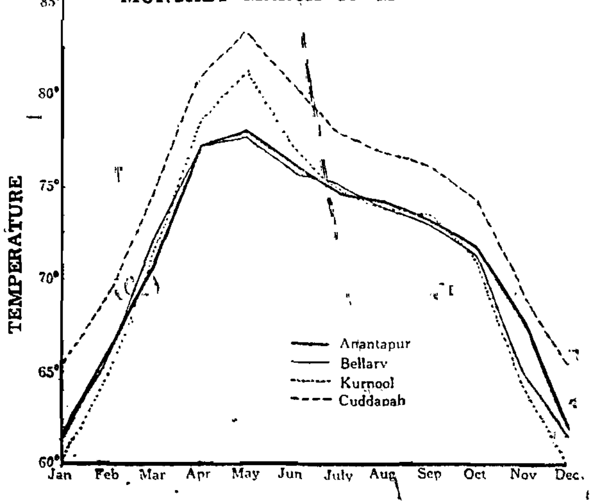


Fig. 3. (17)

MONTHLY MARCH OF RELATIVE HUMIDITY

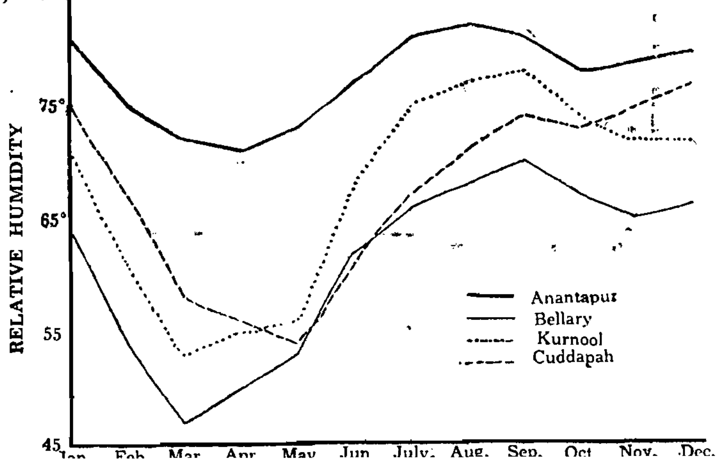


Fig. 4. (18)

MONTHLY MARCH OF PRESSURE AT BELLARY

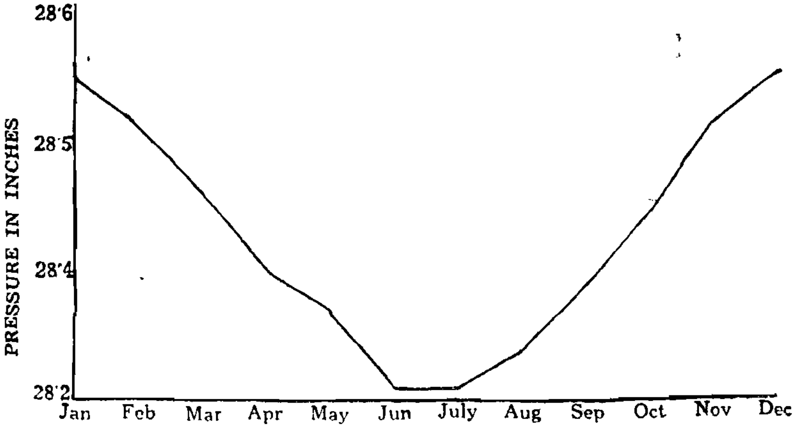
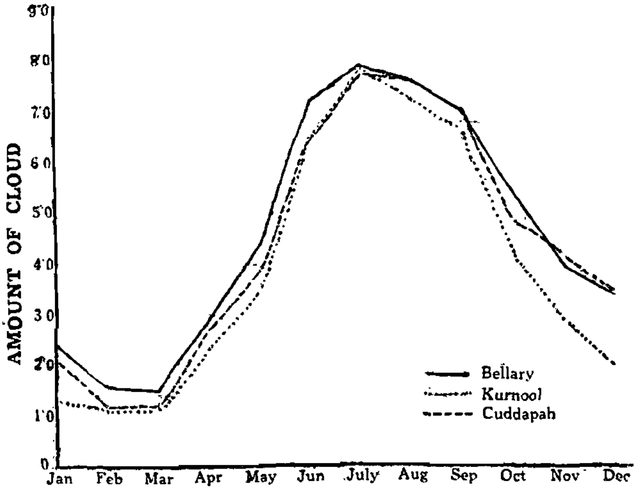


Fig. 5. (19)

MONTHLY MARCH OF CLOUDINESS



again, the maximum at Anantapur is the lowest. The maximum at Cuddapah is the highest throughout the year.

Fig. 2. The highest minimum is recorded during May in all the four places and the lowest minimum during January at Anantapur and in December at the other places. Of these, the minimum recorded at Kurnool is the lowest. From January to March, the minimum at Kurnool is lower than those at the other three places. From March to July, the minimum at Bellary and Anantapur is lower than the other two. From July to October, the minimum at Bellary, Anantapur and Kurnool are nearly equal and from October to December, the minimum at Kurnool is the lowest.

Fig. 3. The relative humidity at Anantapur is the highest of ively. The heaviest fall on record was in 1874 when 38.6 inches of The maximum humidity is during August at Anantapur, during September at Kurnool and Bellary and in December at Cuddapah. The lowest humidity is during March at Bellary and Kurnool, during April at Anantapur and in May at Cuddapah.

Fig. 5. Bellary is more cloudy than the other two districts and Kurnool is the least cloudy of the three. The maximum cloudiness is during July and the minimum during March in all the three places.

We have no data for the atmospheric pressure and cloudiness at Anantapur.

Amount of Rainfall at Anantapur.

Month.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Amount.	0.12	0.49	0.22	0.41	2.40	2.01	4.51	2.84	8.31	3.05	2.83	0.18	27.37

Forests of Anantapur District

By

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Distribution.—The area of the forests in the district is 704 square miles forming 12 per cent of the total area of the district. The great majority of the reserves occur on the hills which run roughly north and south of the district in five more or less well marked lines, viz., Muchukota and Nagasamudram ranges running through the northern half of the district, Mallappakonda, Penukonda and Madakasira ranges running through the southern half. A few of the reserves occur on the detatched cluster of hills round Kalyandrug.

Relation to climate and character of vegetation. The forest growth in general is of a very poor quality. The climatic conditions prevailing in a locality are of great importance in determining the type of its forest vegetation and it will not be out of place to give a brief sketch of these conditions.

The district is one of the driest in the Presidency with an average annual rainfall of 22 to 23 inches. The South-west monsoon which is very capricious and uncertain contributes the greater part of this scanty rainfall, whereas the North-East monsoon leaves behind most of the moisture before reaching Anantapur.

The central part of the district is the driest, and the rainfall in the southern parts is higher than elsewhere in the district, ranging from 23 to 28 inches annually. The hottest period is February to April when every blade of grass is scorched to tinder and so far as the forest vegetation is concerned these dry hot months are the most critical ones, in that they mark the season of forest fires exercising a considerable influence on the constitution and type of the forest.

Thus the tract, being of a very arid nature, supports a degraded type of fuel forests which in parts are merely low thorny scrubs. In the northern and central parts of the district the conditions for forest vegetation are still more adverse, as the soil in the hills of

these parts is extremely shallow with extensive out-crops of sheet rock. As a result, the forests on the Nagasamudram hills in Gooty Taluk, and Muchukota hills in Tadpatri taluk mostly consist of scattered thorny bushes of such species as Randia dumitorum, Carissa carandus, Acacia sundra, Euphorbias and in places stunted growth of Albizzia amara, Dolichandrone crispa and Dodonaea viscosa.

The south stands at a higher elevation and gets more rainfall and the soil is richer and deeper, and as a result the forest vegetation is comparatively of better quality. The best of the forests both in point of growth and density are those on the Mallappakonda hills round Bukkapatnam and Amagondapalayam, and contain fair patches of Hardwickia binata, Anogeissus latifolia, Chloroxylon Swietenia, (satin wood), Terminalia tomentosa and also some stunted teak. But these trees do not grow to their normal dimension to yield any large sized timber, and are only fit to be used as posts, rafters, wall plate etc. A good deal of the growing stock is unsound, crooked and mutilated on account of annual fires, overgrazing and indiscriminate hacking of the adjoining villages in the past. Bamboos are also found to some extent on the hill tops. Sandalwood introduced artificially is also coming up well in the reserves round Amagondapalayam. On Penukonda, Madakasira and Kadiri groups of hills the growth is less varied and valuable, and usually consists of Albizzia amara, Dodonaea viscosa, Acacia sundra and Cassia auriculata with occasional sandal and bamboos.

Agricultural and domestic requirements of people. The surrounding villages are mainly agricultural and their chief forest requirement is grazing. For plough cattle they collect fodder grass in the reserves, the removal of which is permitted free. The grass is mostly of inferior quality and the Forest Department is experimenting to introduce a better type of fodder grass.

The requirements for agricultural purposes are ploughs, plough shafts, handles, harrow pegs, harrow handles, tool handles etc.

The wants of the people for building purposes are very meagre, as they live in huts and mud-roof houses, for which only small sized timber for rafters, posts etc., is largely required.

Apart from their ordinary domestic and agricultural requirements for timber, fuel, thatching and fodder grass, grazing and

numerous minor products, the people are largely dependent on the forests for their very existence in times of famine.

Sources of income. As already mentioned that none of the reserves of the district contain growth of any real size or density, the receipts from the sale of timber are negligible, and the bulk of the revenue is realized from the grazing fees and the sale of minor forest produce such as tanning barks (chiefly Tengedu—cassia auriculata), Beedi leaf, (Diopyros melanoxylon), soap nuts, honey, Tamarind and myrabolams.

Management. In 1926 all the poorer class of forests were handed over to village Panchayats and only such reserves were retained under the control of Forest Department that could be advantageously managed for the production of wood and other produce for local consumption and for grazing, and as also those the preservation of which is essential on climatic and physical grounds. There is now in this district a forest area of 445 square miles under the Panchayat management, and only 259 square miles under the control of the Forest Department.

The Panchayats manage their forests chiefly for grazing under the supervision of the Revenue department. The income derived from grazing and other minor forest produce is utilized by them for constructing and improving ponds and wells, and to some extent in the improvement of forests.

The forests under the control of the Forest Department are those which occur on the Mallappakonda and Kadiri hills comprising two Forest ranges of Bukkapatnam and Kadiri. These reserves are managed under a working plan with the following objects in view.

(a) To improve both the quality and the quantity of the existing growing stock in the economically workable areas by cutting back the damaged stock.

(b) To meet the local demand for fuel, small timber, bamboos, grazing etc.

(c) To work other items of forest produce for revenue.

(d) To increase the value of the forests by introducing sandalwood in all the reserves suitable for the purpose.

(e) To improve the general condition of the forests by regulating grazing and fire protection.

Coupes are worked annually for fuel, small timber, and agricultural implements and the different felling series are so arranged as to meet the local requirements. The coppice growth resulting from the cut back stock and the existing natural regeneration are supplemented by artificial regeneration by introducing more valuable species at suitable burnt patches. This along with protection from fire and grazing gives good promise of better growing stock for future.

Sandal propagation centres are being annually established in all the reserves with a view to increase the proportion of this valuable species in the reserve forests.

Agricultural Geography of the Anantapur District

By

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The District. The District forms part of the extensive Deccan plateau and is situated in the extreme south of it. The country consists of wide plains barren and desolate, interspersed here and there by low ridges, lines and clusters of hills. The land slopes from the south to the north till the valley of the Penner and gently rises again and is elevated in the west in Madakasira, Kalyandrug and the western part of Gooty Taluks.

The Soils. The surface of the land is made up of old and hard crystalline rocks. The alluvial and other formations are of very little significance. The soils fall into two natural divisions, (a) Black Cotton soil and (b) Red soil. The black cotton soil exists in the northern Taluks, Gooty and Tadpatri. It is very soft and sticky and retains moisture exceedingly long. It is an admixture of organic matter and carbonate of lime and possesses certain minerals which give it the peculiar colour. The red soil which occupies the major portion of the District is not of the same quality throughout. A kind of red sandy loam is found in the central Taluks, Anantapur, Kalyanadrug, Dharmavaram, Kadiri and Penukonda, where it ranges from 45% of the total area in Anantapur to 70% in Kalyanadrug. The best of this variety we find in the most southerly of the Taluks Hindupur and Madakasira where there are numerous gardens of cocoanut and areca-nut palms, and many other fruits. It is for this reason perhaps that this part of this District has been rightly called 'the garden of the District'. But even here there are scattered patches of poor red soil.

Climate and Rainfall. The District is far remote from the influence of the sea, and hence has got wide ranges of temperature. In summer the maximum goes up to nearly 104°F. while in winter it falls down to even as low as 55°F. The rainfall is very scanty between 21 and 22″ and even this falls in light showers, working on an average to half an inch per day in the rainy season. There are fairly three distinct zones ; the driest Taluks are in the centre ; the

southern Taluks, Penukonda, Hindupur and Madakasira get 22 to 23″ and Gooty and Tadpatri in the north only about 22″.

Irrigation. The rivers of this District are many of them torrential streams and are of very little use for purposes of irrigation. The other sources are entirely dependant upon rainfall which is always capricious and uncertain. Out of the total cultivated area in the District 3% is watered from the wells, 4% from tanks and 2% from channels. Gooty and Tadpatri have the smallest protected area while Penukonda, Hindupur and Madakasira have the largest.

Agricultural Live-Stock. As regards the agricultural live-stock it is to be said that there is no scientific breeding in the District. Only in Pamdurthi there is an apology of a good breed of cattle. The majority of the working cattle are imported from Nellore and Mysore. Every year travelling vendors tour round the District selling bulls and other animals, the purchase money being received by small instalments. Sheep and goats are grazed in large numbers in pasture lands for the sake of manure and the wool that is obtained from them. Cattle diseases such as Rinderpest, Anthrax, and Foot and mouth disease are frequently prevalent. The Veterinary Department has established three hospitals, and appointed touring surgeons in almost all the Taluks who are doing the best to improve the breed of cattle and prevent cattle diseases and mortality.

Population and Agricultural Holdings. Though the area of the District is very large, aridity, deficient rainfall and general poverty of the soil are its chief characteristics. The density of population being only 156 per Sq. mile, there is plenty of land available for cultivation. Hence about 75% of the population are engaged in agricultural and pastoral pursuits, and the pressure of population is greater in the rural than in the urban areas. The average size of holdings in this District is 10.8 acres with an assessment of Rs. 7-9-0, according to the latest statistics and this is specially notable in black cotton areas.

Agricultural Practice. Agricultural methods may be classified under two heads, wet cultivation and dry cultivation. They vary in this District according to the character of the rain-fall and the soil. Wet crops are raised only on 8% of the total area cultivated as the sources of water supply are not always protected and reliable. Sometimes dry crops are grown on wet lands for want of water. The chief wet crops are paddy, ragi, sugar-cane and betel, the last two being very little.

Paddy is raised largely in the Taluks of Anantapur, Kadiri, Dharmavaram and Penukonda. The cultivation is begun early in July with the setting of the south-west monsoon, or later in September in the event of its failure. The process is defective in many respects. The ground is not ploughed before being soaked with water, the seeds are sown broadcast, and in almost all places transplantation is not done. This results in the lengthening of cultivation, wastage of seed, and uneven crop.

Ragi which is an irrigated as well as a dry crop is grown to a large extent in Hindupur and Madakasira. As it requires less water than paddy it is a favourite crop under wells.

Sugar-cane is raised in Hindupur Taluk more for chewing purposes than for the preparation of Jaggery. A small quantity however is pressed and jaggery is manufactured in a village called Manchepalli, which is considered to be of a very high quality. The method of plantation is peculiar to this District. Instead of cuttings from the tops alone, cuttings from the whole cane are taken and planted in long furrows with trenches between them filled with water.

Betels are planted on level ground as usual but are given less water than considered necessary. Black betel which is less sweet and pungent is a very common variety and the vine differs with the nature of the soil.

Dry cultivation is adapted to the nature of the soil, red or black. In the red soil the cultivation is begun in June or July, the chief crops being Ragi, groundnut and castor. If the south-west monsoon is a failure horsegram, Cambu and Korra are sown as the hingari crop. Horsegram requires little moisture and comes into maturity with the heavy dews of winter. In ordinary years there is no hingari cultivation in this tract. In the black soil the cultivation is started just in the same months as elsewhere. Korra, Yellow Cholam mixed with pulses are sown as the Mungari crop. By the end of September or October cotton is sown mixed with cholam as a hingari crop. Even here ground-nut has replaced Korra as a mungari crop on account of its increased market value.

There is not much difference in manuring between wet and dry lands. Cattle manure is generally used. Sheep and goats are penned in the wet fields and green leaves are ploughed when the land is wet. Other manures, such as municipal sweepings, indigo waste, and refuse from the Gooty tannery, and castor cake are also used by rich land-lords. The milk bush and the Kanuga

leaves are among the best of the vegetable manures. In Madakasira even patta lands are planted with Kanuga trees and the owners derive great benefit therefrom.

Though the methods and implements are primitive in general and usually the same as in other places, those with regard to dry cultivation deserve special mention. The guntaka and the gorru are two implements peculiar to this District. The former is used for removing the stubbles and the latter for seeding purposes. The gorru is not at all known north of the Krishna and in the Tamil Districts except in the adjoining ones. It secures even sowing at uniform depth, economises seed, and permits of weeding by bullock power. Very heavy wooden plough weighing sometimes as much as 230 to 350 lbs are used especially, when bringing waste lands under cultivation. Nowadays iron ploughs have been substituted in many places. Ploughing is rarely resorted to in the regada. Sometimes the holdings are so very extensive and the cattle so rare that it will not facilitate ploughing throughout. Further there is no need perhaps inasmuch as the black cotton soil cracks in all directions very deep and soaking takes place to a considerable depth.

Principal crops and Exports. The stable crops of this District may be briefly stated as paddy, ragi, cholam, cumbu, korra, horse-gram, bengal-gram and oil-seeds such as, gingely, castor and groundnut, and lastly cotton. Of these the food products are intended for home consumption, while the oil seeds, cotton and horse-gram are exported elsewhere every year.

Economic Condition of the Agriculturist. The District on the whole is the poorest and the most backward in the Presidency regarding agriculture and other occupations. The unfortunate ryots have to face very frequently serious droughts. From a study of the statistics it can be seen that the District has been subject to famines every five to ten years with the result that, before the ryot recovers from the effects of one, he is steeped into another. During the current year owing to failure of both the monsoons famine conditions have come to stay and the Government has already opened famine-works throughout the District. If the District is to be freed from such disasters, the only remedy lies in bringing into existence protected means of irrigation, and in educating the masses to adopt improved methods of agriculture on modern lines.

The Economic Geography of the Anantapur District

By

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The District of Anantapur is geographically a part of the Deccan and exhibits all the characteristic physical features of this famous plateau region. Lines and clusters of rocky hills, wide plains broken up by ridges, undulating wastes clothed with a miserable thin grass and dotted with small stunted trees, a few valleys of brighter vegetation, rivers forcing a passage through rocky uplands between steep and high banks and swollen with floods for short periods, but mostly running dry—these sum up the relief of the District.

The district is roughly an oblong in shape, the longer axis running north to south. In the south-west however, a part of one of the districts of Mysore juts so far into it that it nearly cuts off one of its taluks, Madakasira from the rest. But correspondingly in the south-east, the district bulges out.

The general slope is from the south to the north. The two southern taluks of the District, Madakasira and Hindupur are a part of the Mysore plateau and stand at a higher elevation than the rest of the District, the average height being 2000 feet above the sea level. They form a distinct natural region. The soil is red loam and in parts especially where water is available very fertile.

The Central taluks of the District, Penukonda, Kalyandrug Dharmavaram, Kadiri and Anantapur cover a vast expanse and consist chiefly of arid treeless plains. The average height above sea level is 1200 feet. The soil is wretched, made up as it is of red sand and gravel with a slight admixture of red loam and black soil in parts. Most of the land here is more often fallow than under the plough and the resultant diminution in cultivable area gives this region a woeful and poverty-stricken appearance.

The two taluks in the north, Gooty and Tadpatri contain large areas of plains. From the central region as we go north the land

dips into the valley of the Penner which here runs west to east to rise again to a height of 1100 feet in the Gooty taluk. Towards the north-east however, in the Tadpatri taluk, the land does not rise to such a height, but is only 900 feet above the sea.

Though the general slope of the district is from the south to the north, the central portion forms as it were a watershed. The western part drains into the Penner and the eastern into the Chitravathi. The only exception to this is portions of the western sides of the Gooty, Kalyandurg and Madakasira taluks which drain towards the Hagari. The lines of hills in the District run north and south.

The most important river of the District is the Penner. It rises in one of the hills of the Mysore State and enters the district in the extreme south of Hindupur and flows in an almost northerly direction for about 80 miles. Near Pennahobalam in Gooty taluk, it makes a sudden curve to the east and flows through the Gooty and Tadpatri taluks for about 50 miles. In this part of its course the river spreads itself out, its bed is wide and sandy and the banks are low like those of a Deltaic river region. It is in floods for short periods and thereafter runs dry except for a small trickle in the middle of its sandy bed.

The other river of importance is the Chitravathi. It also rises in one of the Mysore hills. Entering the district in the Hindupur taluk, it flows like the Penner due north between steep and high banks through picturesque hills for a length of about 40 miles, until at Bukkapatnam it emerges into a plain and flows into a reservoir, the biggest in the district, the surplus water of which is again dammed in the Dharmavaram taluk. Thereafter several streams join it, it becomes considerable in size, its course changes to the east and running through a narrow channel among the hills across part of the Tadpatri taluk it joins the Penner river in the Cuddapah district. Like the Penner, the Chitravathi is not a perennial river, quickly drying up after floods.

Besides these two important rivers, there are a number of pretty large streams which supply water to irrigation channels and tanks.

The climate of Anantapur is determined by its position in the interior and between 13.75° and 15.15° North. The hottest months are March, April and May when the temperature rises to 103° to 105°. But after the south-west monsoon, the heat goes down and for the rest of the year the climate is tolerable.

The situation of the district in the middle of the plateau region of the peninsula accounts for its being the driest part of the Presidency. Lying as it does in a zone between the two monsoons it is deprived of the benefit of both of them. The Western Ghats are so close that they cut off completely the south-west monsoon from Anantapur and the only evidence to us of the break of the monsoon on the west coast is the setting in of high winds that continue to blow for nearly three months from June onwards. And the district is so far away in the interior from the east coast that the north-east monsoon has already shed its moisture before reaching us. The average rainfall is thus hardly 23 inches in a year.

But the scantiness of the rainfall is not so serious a problem to the ryot as its uncertainty. The bulk of the rain falls in the three months of August, September and October. Of the three natural regions described above, the southern gets about 24 inches, the central 22 and the northern 23 inches roughly. The scarcity of rainfall and its uncertain distribution coupled with the barrenness of the soil in the major portions of the district explain why Anantapur has been periodically subject to droughts and has had many bad seasons, sometimes being on the very verge of famine.

The sources of water supply in the different parts of the district are necessarily adapted to its relief and the amount of rainfall. The southern taluks mostly consist of undulating uplands and afford natural advantages for the comparatively heavy rainfall of this region to be stored up in tanks. This is why Madakasira and Hindupur have a larger percentage of cultivated land under tanks than any other taluks.

River channels are another source of water supply for cultivation. But as the two chief rivers of the district are in flood only for a few days at a time, temporary sand dams are constructed to divert the water of the small streams in wet weather after the floods. Such channels are also dug in the bed of the river to take off the spring water. A more distinctive feature of the water supply of the district for irrigation is its spring channels. They are either dug from jungle streams or from land springs in tank beds and valleys. The former are often dug for miles in the beds of the vankas before reaching their *ayacut,* while the latter are marvels of industry being often excavated to a considerable depth for a mile or more.

About one third of the irrigated area in the district depends on wells. Except in the black cotton soil where the subsoil water lies at a great depth and beneath a stratum of hard limestone and

mostly too brackish to be of any use for irrigation, well irrigation is the most reliable source and the government have taken all possible steps to increase the area under it. The central region by the nature of its physical features depends most on this third source of water supply.

The nature of crops grown in the different parts of the district is determined by the physical features, climate and the sources of water supply of the three divisions.

Wet crops form only 8% of the total area cultivated. This is easily explained by the poverty of rainfall and the general inhospitality of the soil. Most of the wet crop area lies in the south under tanks and to a little extent in one or two taluks of the central region.

Among the wet food crops, paddy necessarily occupies a low place as it requires great quantities of water. Ragi on the other hand is very popular. It requires much less water than paddy. The ragi grower is not therefore weighed down by anxiety even when the tanks do not in any year receive a full supply. It is successfully grown both under tanks and wells. In the southern taluks, because of the large number of tanks and wells, ragi covers more than 20% of the total area covered. For the reasons mentioned above sugar-cane is a valuable crop grown in this same region. But on account of the exhausting nature of the crop, the area under it is small.

In the central region as is but natural wet cultivation is unimportant, and even in the favoured areas dry crops are generally grown, the only exception being the lands lying under the tanks of Anantapur and Dharmavaram.

Horsegram occupies a larger area than any other staple, for this is a crop which will thrive on the most wretched soil, with the most indifferent cultivation and the poorest rainfall, while Samai is the most important food crop. Other dry crops of this area are cholam, Bengal and Red gram.

The central area is also noted for the growing of certain oil seeds, castor, gingelly and recently groundnut. The last mentioned is increasing in popularity, though the natural conditions for its production are not quite satisfactory.

Coming to the north region, it is preeminently a cotton area. The black cotton soil is not only fertile but able to retain the moisture for a long time. Korra is grown as an early crop, but cotton is most important.

The Live-stock problem of the district is a serious one. The hardness of the soil and the low water level demand a strong breed of cattle for agricultural operations. But the difficulty of fodder stands in the way of such a breed being raised. Necessarily better cattle have to be imported. But the sheep of the district are a source of profit to the breeders. In the central region, especially in the west, not only is the climate eminently suitable for sheep-farming but the fugitive nature of the fodder supply makes sheep-farming the only alternative to uncertain cultivation. Hence sheep are reared in large numbers in this central region, for their manure and their skins. In the southern taluks there is a ready market for them, Bangalore importing quite a large number every week for mutton. Thirdly, and this is more important, the Kurubas of the central taluks, especially in Kalyandurg shear the sheep and make use of the wool for the manufacture of cumblies.

The nature of the industries carried on in this district and their location in particular areas can be easily deduced from the facts mentioned above.

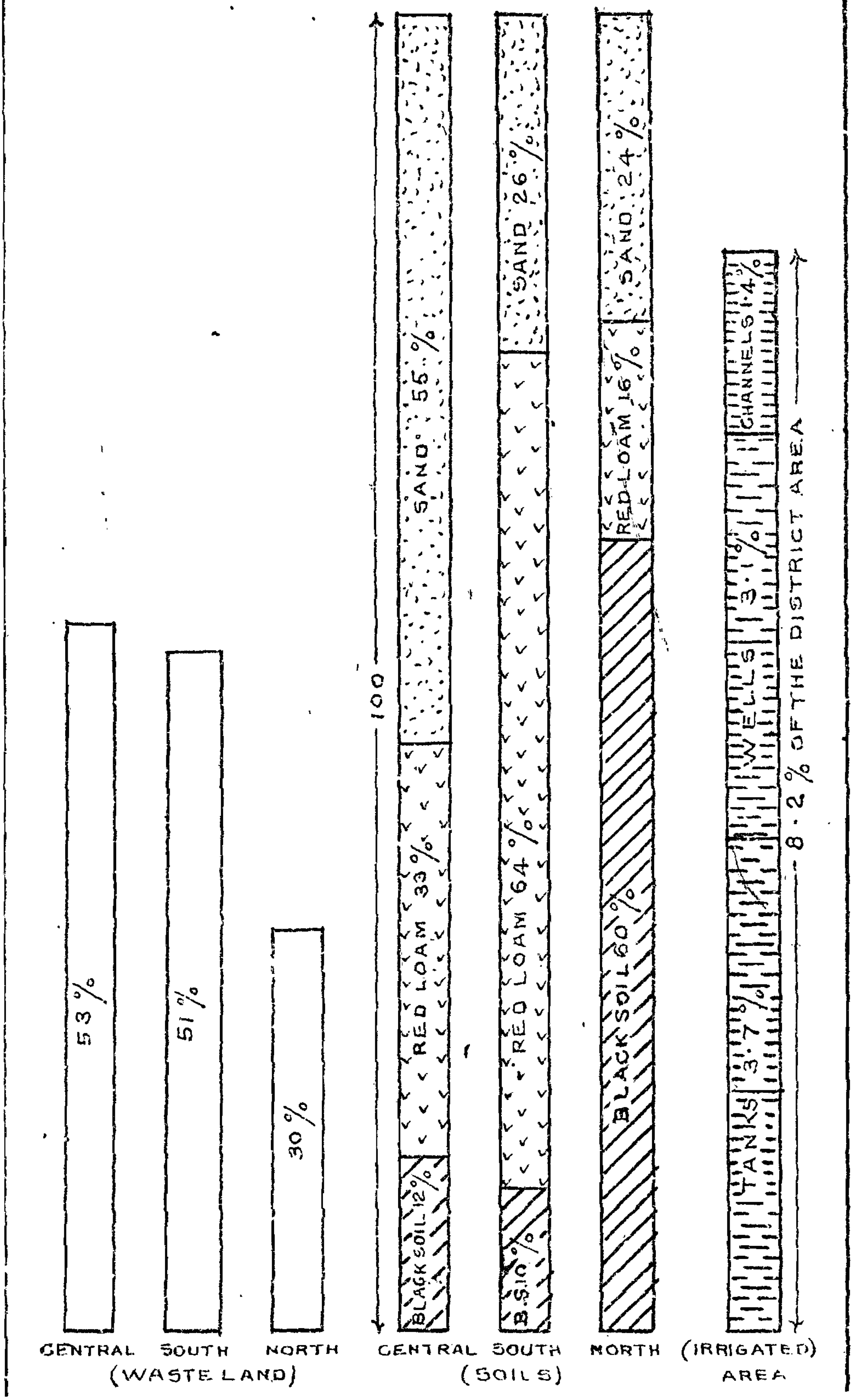
The great cotton belt of the north has given rise to an important industry, the ginning and pressing of cotton. Tadpatri alone boasts of more than a dozen ginning mills, each of which employs 50 or 80 persons, while the Pressing factory owned and managed by Messrs. Binny & Co. is a large affair, giving work to more than three hundred persons. Guntakal and Uravakonda are the other centres of ginning. It may be said that no raw cotton leaves the district now-a-days without being ginned and pressed.

Weaving of cloth is done here and there from imported yarn. Uravakonda, Tadpatri and Dharmavaram are noted for it. But the industry cannot attain to any importance as both the climate and the absence of power are against it. Dharmavaram is also a famous centre for silk cloths and sarees.

The manufacture of cumblies is another characteristic industry of this district. In almost all the villages of the Kalyandurg taluk and in parts of Gooty and Anantapur taluks cumblies are woven from the wool obtained from local shearing. But Belliguppa is most famous for this industry. The manufacturers mostly depend for their wool supply on other parts of the district and to some extent on parts of Bellary. A very brisk trade is carried on in this article. The reason for the localisation of the cumbly industry at Belliguppa seems to be that before the bifurcation of the district, the village was one of the centres of the cumbly industry of the Bellary district; and even after it was

FIG. 20.

PERCENTAGE OF WASTE LAND SOILS & IRRIGATED AREA.



separated from Bellary and attached to the Kalyandurg taluk of this district, it continued to attract the trade in raw wool, and the industry maintained its importance.

The manufacture of jaggery has of late become a minor industry of some importance. The Hindupur market is much sought after for this article and the Manchepalle Bellam of this area has acquired quite a reputation for its sugar content and its comparatively white colour. Groundnut shelling is coming more and more into importance.

On the whole it need hardly be emphasised that the industries of the district are far from attaining to any great importance. A higher percentage of the people than in other districts depend for their daily bread on agricultural and pastoral pursuits alone.

Considering the nature of the ground, we may say that the district has adequate means of communication. It is fairly well supplied with roads and railways. But most of the rivers and big vankas are not bridged. Railway lines pass through all the taluks of the district except Kalyandurg and Madakasira. When these are linked to other parts by means of feeder lines, there will be no reason to complain of inadequacy of means of communication with regard to the trade of these remote areas.

We may easily infer the economic condition of the people of this district from the foregoing short survey of its crop production and distribution, its industries and manufactures. The density of its population (156 per sq. mile) is only half the average figure for the Presidency as a whole. Very few of the ryots are large land holders. The very large majority are small farmer-cultivators. The natural conditions are inimical to agricultural prosperity. "The soil is infertile, the rainfall slight and uncertain, fuel and fodder are scarce, irrigation facilities are few, the indigenous cattle are bad, manure is difficult to get and the people are few in number. Famines and scarcities have been rather frequent and people have suffered much from them. On the whole the district is without doubt the poorest and most backward of all districts whether as regards agriculture or other industries."

But I need not have fortunately to bring my paper to a close on this note of despair. For if report speaks true, two of the mining industries of the district which had for sometime past decayed have a prospect of revival.

Vajra Karur, a village on the road from Guntakal to Uravakonda was once famous for its diamonds. It is said that one of the

Vizianagar Emperors had a regular agent at the place to buy up the stones discovered. Even to-day after heavy rains, people swarm to the place to try their luck and roam about in search of diamonds washed on to the surface. Only 5 years ago a diamond found by a villager fetched 5000 rupees in the Madras market. No wonder that sowcars from Hubli and Bombay come periodically to the village to strike bargains. I am told that two mining licenses have been granted recently.

But the more important mining industry, is the gold industry of Ramagiri, a village in the Dharmavaram taluk. For nearly two decades till 1925, the North Anantapur Gold Mines Company Ltd. was working this gold mine evidently at a profit. But perhaps owing to the drop in the price of gold, the concern had to be wound up. The present phenomenally high price of the yellow metal has induced a firm to take out a license for restarting the mining work in the hills near Ramagiri village.

So then, gentlemen, if this industry at least succeeds, Anantapur may become a rival to the Kolar region of the Mysore State, and when the next Geographical Conference meets in this town, the gentleman who will be reading a paper on the Economic Geography of this district will have the pleasure to dilate on the greatness of the industry and the consequent increase in prosperity. May this poor district have such a happy consumation in the near future !

Urban Geography of Anantapur District

By

Mr. R. Dann,

Director of Town-Planning, Madras.

Owing to the climate and the resultant nature of the terrain the prospect of urbanisation on any large scale in Anantapur is somewhat remote. The rainfall of the district is uncertain and averages only 23 inches annually, and much of the soil is rocky and infertile ; and there has been no large scale irrigation, but parts of the district stand to benefit by the Tungabadra project if and when it is carried out. The District is comparatively healthy according to the vital statistics; but the population is emigrant in character owing to lack of opportunity within the District itself. Such conditions are not conducive to rapid growth as there is no *raison d'etre* for rapid expansion. The population of the whole district is 10,50,411 and the area 6740 sq. miles giving an average of only 155 per sq. mile as against the presidency average of 328.

It is not an easy matter to write a paper on the Urban Geography of Anantapur Town or the Towns of the District, for it is the least urbanised District in the Prsidency and there is very little of note in the way of urban development in any of the towns. Anantapur town itself though a District headquarters has a population which is less than many villages. The Municipalities of Anantapur, Hindupur and Tadpatri are 74th, 77th and 78th in order in the 83 Municipalities in the Presidency. The biggest agglomeration of population in the district is however not Anantapur town but the villages of Timmancherla and Guntakal which go to make up Guntakal town with a population of 15,620. The curious fact about Guntakal is that the Railway Junction of that name is in Timmencherla and two miles away from Guntakal proper. Whereas Guntakal is near to Timmancherla station ! Although the towns of the district are so small, they have shown large increases during the last half a century, Guntakal having increased from 3099 to 15,620, Anantapur from 4,907 to 15,099, Hindupur from 6,694 to 14,211 and Tadpatri from 8,585 to 12,600. The panchayats of Uravakonda, Gooty, Kadiri and Dharmavaram have also shown varying but fairly large increases. The total population in these 8 towns is 78,019 as compared with 55,881 50 years ago, an increase

of nearly 40%. Even so the 8 towns together have much less than such towns as Coimbatore, Salem or Calicut and less than half the population of Madura and much less than George Town. Under the circumstances there is not much that can be discussed under the heading of Urban Geography of the District. The urban population is 110 per thousand of population in the district.

Anantapur Town gives the impression of a larger town owing to its possessing all the buildings associated with a District Headquarters together with the modern buildings of the Ceded Districts College, the Police Recruit school etc. It is in two distinct parts, the congested old town under the bund of the great tank constructed in 1364 by Chikka Udayar, a minister of the early Vijayanagar Kings and surrounded by wet lands and the nearer area including Government offices on the higher dry lands nearer the station with the modern George Town extension area, on the west side of the station. No development schemes have however been carried out under the Town Planning Act, the George Town extension having been carried out previous to the introduction of that Act with assistance from Government and by the help of Co-operative Building Societies. Anantapur has a protected water supply system but no satisfactory drainage.

Next to Anantapur in importance is *Hindupur* with a population of 14,210, a recent municipality of progressive tendencies, for although so small it was one of the earliest municipalities to carry out an electricity scheme. On the other hand it has no protected water supply system. It is situated in the Guntakal Bangalore metre gauge section of the M. & S. M. Ry. but geographically somewhat off the beaten track, for it is not on a Trunk road; but it is about the largest commercial centre in the district having a number of cotton ginning and groundnut decorticating mills.

Towards the Northern end of the district is the third municipality, *Tadpatri,* with a population of 12,600. Tadpatri is also a commercial centre chiefly interested in cotton and groundnuts and a large moving population. It has two temples of interest; Mr. Fergusson particularly commends the Gopurams of the temple that is now disused.

Guntakal in the North has already been mentioned as it has the largest population of any town in the district, a position which it owes to the fact that it is one of the most important Railway Junctions in South India being on the Madras-Bombay main line and having metre gauge connections in addition with Marmagoa,

Bangalore, Hyderabad and Bezwada. It is the metre gauge district headquarters, whilst only a few miles away *Gooty* (population 9,712) owes its development to the fact that it is the broad gauge district headquarters. Guntakal adds cotton ginning to its railway activities but Gooty is without any serious commercial or industrial interests. Gooty, moreover, is a taluk headquarters and was at one time a municipality. It has a fine hill fort in excellent preservation.

Dharmavaram is another town which has grown considerably due, no doubt, to some extent to the fact that it is a Railway Junction. It is an important weaving centre.

Of towns with a past *Penukonda* should be mentioned. It is a Taluk headquarters, a small town with a diminishing population of about 5000, but it has one of the most picturesque hill forts in South India of great historical interest as the refuge of the Vijayanagar dynasty after their defeat by the Mussalmans. It has a palace and Temples of great architectural interest.

Population of Anantapur District

By

Mr. K. Srinivasaraghavan, M.A.,

The District of Anantapur lies east of the Mysore state, and is bounded by the Bellary, Kurnool, Cuddappa and Chittoor districts on the other sides. It is one of the four Ceded Districts. The whole area of the Ceded Districts in general is very poorly peopled, except along the narrow valleys of the Penner and its tributaries. The area has a low rainfall and has been historically the cockpit of the powers to the North and South. In the earliest times the Cholas and Hosalyas on the South contended with the Chalukyas on the North. In modern times this area has been the middle region between the Maharattas, the Nizam, the English and Mysore (under Haidar and Tippu). Except perhaps during the days of the greatness of Vijayanagar, these districts have never had independence and were never well developed under an established rule.

In addition to this, the relief has played an important part. Covered over by low hills, with an infertile soil and low rainfall, it has never been coveted by man. It lacks natural mineral wealth, and there is no easy irrigation system possible. It has not had any developments in the near past to create urban centres. Thus lacking in agricultural and industrial resources and having no artificial nodalities, and historically being the battle ground of powers, and never having possessed peace and prosperity, it has not developed in human settlements, and hence the low population.

Anantapur is typical of the whole region. It is covered by hills, possesses an infertile soil and has an annual rainfall of less than 25″. It can roughly be divided into parallel strips running N to S., along the Penner and Chitravathi valleys, with a wide strip of lowlands in the N. E. of the district. Of the nine taluks into which it is divided for administrative purposes, the middle region comprising the taluks of Kalyandurg, Anantapur and Dharmavaram is the least densely peopled. The important towns lie either in the river valleys or along the railway lines. The towns on the railway lines have shown a greater improvement in the last decade than the other towns. Of these Guntakkal, the first town of the district, has been rapidly developing due to the railway colony and the consequent development of the area as an industrial centre of some sort. Anantapur, the second town in

population, is still of importance being the district headquarters and has a first grade college—the only college of the Ceded Districts. Hindupur, is the next biggest town owing its importance to the merchant community of the place and its nearness to the Mysore state and its position on the highway between Mysore and the Ceded Districts.

Distribution of population. Lying far interior from the rich lands of the East and west coasts and situated in the rain shadow of the Western Ghats it has almost the lowest density of all the 26 districts in the Madras Presidency. Its density per sq. mile is 156 while the Presidency average is 328. It is the 25th in the rank of densities, the last (26th) being Kurnool with 135. In extent it is the 7th (6741 sq. miles) in the Presidency and in strength of population it is the 21st (1050411). The distribution of urban rural population is 1:8; 117421 out of 932990 live in towns. This is too high a proportion for any district in India and indicates that people are deserting the villages and are gathering in towns. There is a flood of emigration also going on, which on the whole weakens the population of the District. The variation of the density in the 9 taluks, still better indicates the geographical control on human activities, Hindupur taluk has the highest density of 256 followed by Madakasira 218. The least dense is Kalyandrug with 167. There are very few taluks in the Presidency with so low a density as that of Kalyandurg.

STATEMENT I.

Variation in population. From the year 1891-1931 the population has had the following variation in every 10 years. + 71117, + 29466, − 7306, + 9449, and the percentage for 1911-21 is − ·8 and for 1921-31 is + 9·9. The population has been steadily decreasing in variation till 1921 and then there has been a slight increase during the last decade. The decrease in the otherwise steadily increasing Indian population denotes an emigration that has been detrimental to the agricultural possibilities of this area.

Among the taluks Kadiri and Gooty have had the greatest increase. Guntakal and Gooty have been growing in importance as railway and industrial centres. Kadiri has enjoyed a spell of a happy decade and is growing into a small industrial centre. But Madakasira has been densely peopled by a rural population and is still increasing in strength. The factors that have caused the growth of Hindupur have partly improved this taluk. The recent improvements in Mysore have had their repercussions in this taluk which lies like a peninsula into the Mysore state surrounded on all sides except the East.

But the greatest variation is to be observed in the population of towns. Except two or three the other towns are still very low in population. There are 12 important ones. The biggest of these is Guntakal with 15620, followed by Anantapur with 15099. The towns of this district are much less peopled than some of the villages in the deltas of Kaveri, Godaveri or Krishna or the narrow strip on the west coast about Calicut.

STATEMENT II.

Languages of the district. The language of the district is mainly Telugu. But Canarese is also spoken by the merchant class, who have dealings with Mysore on the one side and Bellary on the other. The Tamil population is restricted almost to the Brahmin Community. The following table gives the relation of languages among the Brahmins:

Telugu	..	10062
Kanarese	..	6902
Tamil	..	1295
Brahmins	..	18259

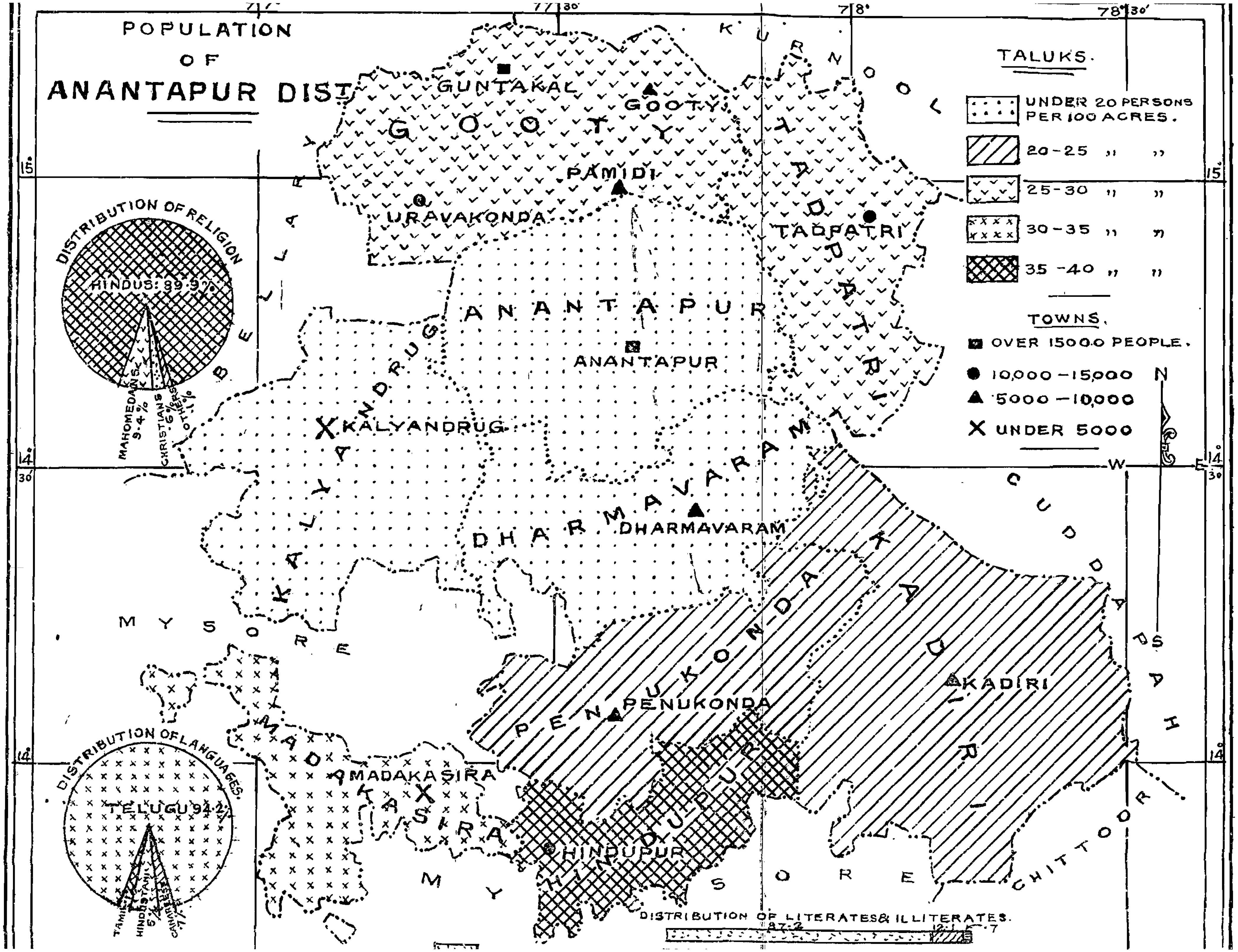
Hindustani is spoken by a considerable number especially in the Kadiri and Gooty taluks where the Mahomedan population is greater. There are a few Christians in Gooty and Guntakkal. The history of Christian missionary activities in this district has seen various phases, and though brought in very early, it has not had very much of a success.

Telugu is spoken by	..	94.2%
Canarese	..	.7%
Hindustani	about	.5%
Tamil	..	.1%

STATEMENT III.

Literacy and Education. The number of people who can read and write in their mother tongue is as low as 12.1 per hundred of the total population. The percentage of literates in English is only ·7.

In general the education in this district is very poor. The percentage of literates is abnormally low. The percentage of school going population is 5·4 which indicates that the literate percentage will not increase even in the next 10 or 15 years. But for all the Ceded Districts, it is this district that possesses a Govt. College for higher studies with a strength of 301 boys. There are 10 secondary schools (1 of which is for girls) with 2255 pupils.


POPULATION
OF
ANANTAPUR DIST
TALUKS.
UNDER 20 PERSONS PER 100 ACRES.
20-25 " "
25-30 " "
30-35 " "
35-40 " "
TOWNS.
OVER 15000 PEOPLE.
10,000-15,000
5000-10,000
UNDER 5000
DISTRIBUTION OF RELIGION
HINDUS: 89.9%
MAHOMEDANS 9.4%
CHRISTIANS .6%
OTHERS .1%
DISTRIBUTION OF LANGUAGES.
TELUGU 94.2
TAMIL
HINDUSTANI 5.4
CANARESE
DISTRIBUTION OF LITERATES & ILLITERATES.
87.2
12.8
GOOTY
GUNTAKAL
GOOTY
PAMIDI
URAVAKONDA
TADPATRI
TADPATRI
ANANTAPUR
ANANTAPUR
KALYANDRUG
KALYANDRUG
DHARMAVARAM
DHARMAVARAM
PENUKONDA
PENUKONDA
KADIRI
KADIRI
MADAKASIRA
MADAKASIRA
HINDUPUR
HINDUPUR
KURNOOL
BELLARY
MYSORE
CUDDAPAH
CHITTOOR
N
W
E
S
15°
14° 30'
14°
77°
77° 30'
78°
78° 30'

There are 3 training schools for Masters and one for Mistresses with a total strength of 271 pupil teachers.

STATEMENT IV.

Religion. The population is mainly Hindu with a sprinkling of Mahomedans and Christians. The only considerable percentage of Mahomedans is found in the two taluks of Gooty and Kadiri and the Christians are almost limited to the Gooty taluk.

Occupations and Industries. The major portion of the population live by agriculture, and very few are employed in any industrial concern. There are a few groundnut mills and ginning mills at Hindupur, Guntakkal and Gooty. There are a few local industries, *e.g.*, Hides and skins at Gooty which is suffering for want of protection. Hindupur and the surrounding areas have a few hand looms. Dharmavaram is a weaving centre. The towns were once specialising in the export of groundnuts, cotton and tamarind. But the depression in trade has affected both the industry and agriculture.

Health and Hospitals. This district is one of the healthiest and has a very low death rate. Death rate per 1000—is distributed as follows. Fever 5.6, dysentery 2.4, cholera 1.4. Plague rarely visits the district and has only once attacked Anantapur causing a mortality of 7·2 per 1000.

Drink and crime. For the small population the number of liquor shops is far too much ; and for cases of murder and assault the district is one of the worst in the Presidency.

	No. of shops.	Visitors.
Toddy	550	1728
Country spirits	219	4365
Ganja	18	53107
Opium	11	86902

Crimes (1930) Murder	.. 30
Culpable Homicide	.. 5
Assaults	.. 47
Cattle theft	.. 40

There are 226 known depredators, with a police force of 689 and 12 sub-jails.

This shows that immediate attention has to be paid to the growing population of Anantapur (i) to prevent their emigration to other districts or to towns (ii) to give the necessary help to improve the existing poor state of agriculture and (iii) to engaging the labour of the available idle men who otherwise take to drink and murder.

STATEMENT I.

Population of Taluks.

No.	Name of Taluk.	Area in sq. miles.	Towns.	Villages.	Occupied Houses.	No. of Males.	No. of Females.	Total Population in 1931.	Density per sq. mile.	Increase % from 1911-21.	Increase % from 1921-31.
1.	Anantapur ..	926	1	114	23688	61049	55909	116958	126	5.4	4.6
2.	Kalyandrug ..	821	1	74	17590	45236	42211	87447	107	—3.9	9.1
3.	Dharmavaram ..	736	1	63	18888	46496	43528	90024	122	—1.3	1.5
4.	Kadiri ..	1162	1	141	35867	89600	83654	173254	149	2.0	15.2
5.	Gooty ..	896	4	132	31569	81476	78164	159640	178	—9.3	18.8
6.	Tadpatri ..	641	1	97	117315	59373	57942	117315	183	—2.4	5.2
7.	Hindupur ..	431	1	77	23507	56785	53409	110194	256	3.9	9.7
8.	Madakasira ..	446	1	57	19160	49273	47808	97081	218	4.2	13.4
9.	Penukonda ..	682	1	98	23399	50246	48252	98498	144	—1.0	6.0
	Total ..	6741	12	853	215487	539534	510877	1050411	156	— .8	9.9

STATEMENT II.

Population of Towns.

Rank.	Town.	Population in 1931.	Population in 1921.	Increase % from 1911-21.	Increase % from 1921-31.
	Total for district ..	1050411	955917	— .8	9.9
2	Anantapur ..	15099	11452	35.4	31.8
8	Dharmavaram ..	9346	8117	9.9	15.1
6	Gooty ..	9712	8720	— 9.1	11.4
1	Guntakal ..	15620	12519	26.6	24.8
10	Pamidi ..	5147	5230	—32.4	— 1.6
5	Uravakonda ..	12079	10274	— 6.8	17.6
3	Hindupur ..	14211	12456	12.9	14.1
7	Kadiri ..	9352	11619	11.03	—19.5
12	Kalyandrug ..	4419	4596	—30.98	— 3.2
11	Madakasira ..	4524	3641	—31.3	24.3
9	Penukonda ..	5262	7385	9.8	—28.7
4	Tadpatri ..	12620	11293	—10.3	11.8

STATEMENT III-(a).

Literates per Taluk.

No.	Taluk.	Total Literates in M. Tongue. Males.	Total Literates in M. Tongue. Females.	Literates per 1000. Males.	Literates per 1000. Females.	Literates in English. Males.	Literates in English. Females.
1.	Anantapur ..	7566	1080	124	19	1757	167
2.	Kalyandrug ..	4730	313	105	7	264	7
3.	Dharmavaram ..	4343	320	93	7	430	20
4.	Kadiri ..	8557	665	96	8	400	21
5.	Gooty ..	10927	1191	134	15	1889	237
6.	Tadpatri ..	6546	479	110	8	502	17
7.	Hindupur ..	6593	719	116	13	791	63
8.	Madakasira ..	5388	382	109	8	358	6
9.	Penukonda ..	4874	475	97	10	477	29
	Total ..	59524	5624	110	11	6868	567

STATEMENT III-(b).

Literates by Religious Communities.

	Total Literates in M. Tongue.		Literates per 1000.		Literates in English.	
	Males.	Females.	Males.	Females.	Males.	Females.
Hindus ..	49916	4516	103	10	5533	266
Mahomedans ..	8108	476	161	10	735	23
Christians ..	1213	611	354	196	576	275
Others ..	287	21	462	40	24	3
Total ..	59524	5624	110	11	6868	567

STATEMENT IV.

Population of Religions.

No.	Taluk.	Hindus.	Mahomedans.	Christians.	Others.
1.	Anantapur ..	106648	9587	676	47
2.	Kalyandrug ..	83850	3503	83	11
3.	Dharmavaram ..	84895	4762	349	18
4.	Kadiri ..	150259	22334	655	6
5.	Gooty ..	136826	20450	2293	71
6.	Tadpatri ..	100584	14761	1908	62
7.	Hindupur ..	93345	114700	309	70
8.	Madakasira ..	92698	3489	46	848
9.	Penukonda ..	89663	8598	227	10
	Total ..	943768	98954	6546	1143
	% of the Total for the District ..	89.9	9.4	.6	.1
	Grand Total for the District ..	1050411			

The Geography of Gooty Town

BY

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London Mission High School, Gooty.

1. Gooty town (Lat. 15° 6′ 53″ N. long. 77° 4′ 32″ E.) in Anantapur district is 32 miles away from Anantapur to the North-east. Situated on the main railway line from Madras to Bombay, it is 258 miles from the former. It is the headquarters of the Northern division of the district, though there are at least 3 towns in the division itself which are far more important in trade and population.[1] The town proper covers an area of more than 9 square miles; and the union panchayat area covers much more.[2] Its height above sea level is 1200 ft .

2. Gooty town is a fairly flourishing place, but it is neither a commercial nor trading centre, and is chiefly held together by the offices and institutions which exist within it. Its chief claim for fame rests on its fortress and the part it played in the shaping of South Indian History.

3. Though there is no continuous history of Gooty available, it is clear from the many records and inscriptions found in various parts of southern India that Gooty was a famous place from at least the 10th century A.D. The fort of Gooty was considered to be the key position for the central area, and the various dynasties of rulers who came into prominence in quick succession in the middle ages, conquered Gooty from their predecessors and caused it to be recorded in inscriptions. Such inscriptions of the 12th and 13th centuries are found at Kalyan in the Nizam's dominions, at Harihar in the Mysore territory and at Daulatabad. Later when the Hindu Kings of Vijayanagar ruled over most of Southern India, Gooty is said to have been the seat of one of the principal Governors of the Kingdom, and a large part of the fort was constructed in those days. After the fall of Vizianagar it fell

1. Population of the towns in 1931 were: Gooty 9690, Tadpatri 12620, Guntakal 15620, Uravakonda 12079.

2. The union panchayat area cannot be given accurately since it has not yet been surveyed.

into the hands of the Muhammadans and subsequently into the hands of the Marathas, of whom Morari Rao was the last great ruler who made Gooty his centre of activities. In 1775 Hyder Ali conquered the fort and sent Morari Rao into imprisonment.

Gooty formed part of the territory ceded to the company by the Nizam in 1800, and the place was garrisoned by 3 companies of native infantry under the command of two British officers. They were finally withdrawn about 1860 after the present police force had been organised.

4. It is not without reason that Gooty was held to be the Key position of the central area in the olden days. The two main reasons for the importance of the town in the olden days were (i) the usefulness of the towering rock and (ii) the natural advantage for constructing a first class fort.

(i) Gooty rock rises to a height of 2171 ft. above sea level and nearly 1000 ft. above the level of the surrounding country. It is almost the highest point in the highest part of the taluk except the Nagasamudram hill. The rock commands all the fortifications and the town in the centre, and in spite of the undulations of the surrounding country, one can easily see with the naked eye a distance of more than 20 miles from the top. It is said that from the top of the rock, messages were sent with the aid of light flashes, to Adoni and Bellary, both of which are 50 miles away. Considering the lack of means for quick communications in those days, the importance of the rock as an observation centre cannot be easily exaggerated. It served as an excellent watch tower in days of the Maratha raids.

(ii) In the middle ages of unstable governments, security from raiders was the principal factor in selecting the site of the seat of a chieftain, and Gooty afforded an ideal site for the construction of a first class fortress. Wilks describes the fort as follows :—

" The fort is composed of a number of strong works, occupying the summits of a circular cluster of rocky hills, connected with each other, and enclosing a level space which forms the site of the town. The town is approached from the plain by a single fortified gateway on the South-west, and by two small foot-paths across the lower hills, communicating through small sally-ports. An immense smooth rock, rising from the northern limit of the circle, and fortified by gradations surmounted by 14 gateways overlooks and commands the whole of the other works and forms

a citadel which famine or treachery alone can reduce. About half-way down the side of the great rock is a projecting shoulder of considerable extent on which are barracks for the regular troops, now fast falling into decay.

5. With the improvement of military equipment and methods of warfare, the importance of Gooty as a place of security and protection became less and less, and by the middle of the 19th century the British abandoned the town as a military station, and it was saved from going into oblivion by two other factors.

(i) Before 1852, there were no good roads worth the name in the whole of the district. The construction of roads received a great impetus during the famines of 1866 and 1876, and now two of the three best metalled roads in the district pass through Gooty. One of them is the Secunderabad Bangalore Road, which runs from Kurnool through Gooty, Anantapur and Penukonda into Mysore territory. The other is the Cuddapah-Bellary Road which runs across the whole of the northern portion of the district, from Bellary through Gooty and Tadpatri on into Cuddappah. There is also a branch road from Gooty to Adoni through Pattikonda. Thus Gooty became an important nodal town of the district.

(ii) Gooty was connected to Madras by the Railway in 1869 and was almost the first important place of the central districts to be placed on the Railway map. With the improvement of railways Gooty was made the headquarters of a Railway District, and it became the seat of District Traffic,[3] Loco and Engineering offices and a considerable settlement has sprung up round this railway station and is often distinguished from Gooty proper under the name of Gooty R. S.

6. Gautamapuri was the ancient name of the place and the present Gooty is a corrupted form of Gautamapuri. Local tradition says that its name is derived from the fact that the Rishi Gautama lived upon one of the rocks. A small cave in a hill to the north of the railway line about ½ a mile from the railway station on the way to Madras, is pointed out as the place of residence of the sage Gautama and is locally known as the Gautamasrama. A devoted railway servant has beautified the place by the construc-

3. The District Traffic Superintendent's office has since been removed and amalgamated with the one at Royapuram.

tion of a small temple near the cave, and a well and a small building for the use of the visitors. Railway passengers travelling by train to Madras can easily recognise the place by the flickering lights in the temple, or the red and white paintings on the rocks to their left. Mr. Francis has recorded an interesting suggestion made to him that the Telugu *guththa* (a cluster or bunch) might have been the original of the name since this word is descriptive of the group of hills on which the fort stands.

7. Gooty town as it is may be divided into 3 parts, popularly known as the Kota, Peta, and Gooty railway station. The first two divisions making up the town proper are at a distance of about two miles from the latter, which itself is situated round the Gooty Railway Station. As the names indicate *Kota* is the area enclosed within the fort and surrounded on all sides by the bare rocks. *Peta* is the trade and business centre.

There is only one main street in the town, beginning from the foot of the highest rock passing through all the town and leading to Gooty Railway Station. Except for a branch road from the fort gate leading to the High School and the tank, all the town is constructed within about a hundred yards of this main street.

Kota is roughly triangular in shape with its base to the east and its apex coinciding with the fort gate on the west. Being enclosed on sides by the rocky hills, the town here is very narrow and congested. There is little or no open space and the houses are all close to one another.

Emerging out of the fort gate we come away from the rocks, and the town spreads here on both sides of the main road, and the branch road. At the end of the branch road on the South-Western side are the high school and the London Mission Colony; will its spacious bungalows and large compounds. Further west is the large tank said to have been constructed in 1619 by Rama Raya one of the expatriated princes of the Vijianagar dynasty.

At the western end of the main street, about a mile from the rock is the Munro Choultry. Here the Street meets the Kurnool—Bangalore Road and the Gooty—Pattikonda Road. A few yards from the choultry, on the western side of the Kurnool road and to the N. E. of the Pattikonda Road are the several public offices and the Munro Hospital.

To the north of the offices a new colony of lawyers and officials is fast growing. Tired of the congestion and the unbearable heat of summer, some of the well-to-do lawyers and officials are finding

it more convenient to build roomy and well-ventilated houses here.

8. The recorded population of the town was as follows:—

1871.	6730.	1911.	9587.
1881.	5373.	1921.	8720.
1891.	6605.	1931.	9690.
1901.	9682.		

Within the last 30 years there has been practically no difference in the total population of the town. The marked fall of 9·1 % in 1921 was due to the influenza epidemic of 1918 and the disease was particularly fatal to persons in the prime of life, which naturally affected the birth rate in the succeeding years.

The Brahmins form 6·7 % of the population, and most of them live in the *Kota*. Being an intellectual class all of them follow the learned professions and lead a well-to-do life.

The Harijans make up 15·3% of the total population and most of them live in quarters set apart for them at the foot of the hill in *peta* to the south of the branch road leading to the tank. Being the poorest class, they all live in small hovels and low-roofed houses. They are all agricultural labourers depending for their daily morsel of food and drink on the daily wages they earn and consequently they are the first and worst to be affected by a bad season.

The Muhammadans form 30% of the population. Since they observe the *purdah* they live in exclusive quarters at the two ends of the town i.e., the eastern end of the *Kota* and the western end of the *Peta*. Some of the richest as well as the poorest of the people are among the Muhammadans, and they follow all walks of life.

The Christians are equal in number to the Brahmins, and like them, they are well educated. All of them live in or near the mission colony and most of them are dependent on the mission institutions.

The other Hindus including the Vysias form the majority of the population and they live mostly in *Peta* and the outlying areas in the *Kota*. Many of them are agriculturists and live by toiling in the fields. There is a large number of Vysias, and all of them live near their shops in the main bazaar in *peta*.

Nearly every one of those living in Gooty Railway Station is dependent directly or indirectly on the Railway. People belong-

ing to all castes and creeds live here, and the Anglo-Indians form a fair proportion.

9. The climate of Gooty is very hot in summer, really cool in winter and dry throughout the year. Though there has been no systematic record of temperatures, it can be confidently said that the average maximum temperature during the hottest months of March, April, and May remains between 100° and 105°. Being surrounded on all sides by the bare granite rocks, the reflected heat and glare of the afternoon sun is unbearable in this season. If there are good showers in June the temperature drops down by about 10° and continues to go down till December our coolest month. Winter is really cool and the mercury often goes below 60°.

The Rainfall of Gooty is poor indeed, and at times (as in this year) it is very disappointing. Below are given the rainfall figures and the actuals for 1934.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Average*	0.14	0.16	0.09	0.51	1.80	2.05	2.19	2.54	6.00	3.95	1.84	0.20	21.47
1934	—	0.27	—	1.05	1.45	1.93	3.68	0.91	0.40	1.68	0.89	0.06	12.30

The early showers of April and May enable the agriculturists to prepare the soil, and the sowing is done in June or July after the good rains. September is our rainiest month and the agriculturist looks to this for thorough soaking of the soil for the grown-up crops to put on corn. From the figures given for 1934 it is clear that the September rains disappointed all fond hopes of the eager agriculturist.

The average figures are very misleading and the actual figures of total rainfall vary from less than 9 inches as in 1923 to more than 36 inches as in 1916.

The water supply of the town is dependent on the several wells, and they in turn are dependent on an abundance of rainfall on the hills. As the amount of rainfall is very uncertain, water scarcity in the town is very frequent and in 1924 after the very poor rainfall of 1923, there was not a drop of water in the whole town for a few days. No wonder that it is recorded of the capture of the fort by Haidar Ali that "Morari Rao could no longer restrain his men from exclaiming even from the parapets, to the besiegers that they were dying of thirst, and begged to capitulate." Such of those who lived in Gooty in 1924, and are living now awaiting

the threatened water scarcity in summer can easily appreciate the above quotation.

10. There is little or no natural vegetation worth the name. The hills and the waste lands stand bare except for a bush of cactus here and there.

About 60% of the people live by cultivating the soil and growing grain and groundnut. The soil in and around Gooty is very poor red soil, and the poverty of the land can be judged from the fact that as much as 69% of the extent of the land in the revenue town of Gooty is left waste.

The long but shallow tank to the west of the town is intended to provide water for growing rice in an area of 960 acres. But on account of a series of bad rainfall years, the tank was never full within these 15 years, and consequently the extent of land growing rice has been considerably smaller.

In 1933, 1725 acres of land round Gooty was devoted to the growing of dry crops. 1037 acres or 60% of the cultivated land was used for growing the food crops, jonna, korra and sadda. The only crop that flourishes well in the red soil and provides the poor ryots with a little money for their clothing and other necessities is groundnut, and so a good proportion of the land is used for producing groundnut. In recent years however there has been a gradual reduction on account of the great fall in the price of the seed. Last year only 11% of the area was used for groundnut.

Among the other crops that are grown pulses form a large proportion.

11. As has already been noted, Gooty is no big trading place and no exact figures are available. The one important export from Gooty is groundnut. Since the roads from all directions converge on Gooty, and there is a big railway station, all the groundnut grown in and around Gooty is brought here for export. Near the railway station there are four groundnut decorticating factories, and several gouhdnut trading companies have opened branches in Gooty Railway Station.

12. There is but one industry worth mentioning in Gooty. Near the railway station, by the side of one of the feeder streams of the Gooty tank is an old established tannery, giving employment to about 60 workers and preparing everyday about 600 skins for export. On account of the slump in the hides and skins trade due

to the import restrictions in Germany and the increasing use of rubber and synthetic rubber in place of leather, and the consequent diminution in the demand for leather, the production in Gooty tannery has considerably fallen down within these 2 or 3 years. Formerly the tannery produced a 1000 pieces a day and provided employment to more than a 100 workers.

13. The most interesting site in Gooty is the famous hill fortress which has already been described. " It contains no buildings or remains of great architectural interest. On the top are two erections which were apparently a gymnasium and a powder magazine respectively, and on the edge of a cliff 300 ft. high is a small pavilion of polished chunam which is called Morari Rao's seat and commands an excellent view of the town below. There are many other buildings in ruins, and some of these were used by Munro as prisons for refractory poligars. The fort and the buildings on it are on the list of constructions specially conserved by Government.

For the religious needs of the people there are many temples and two of them were built in the days of Vijianagar's glory. One of them is at the foot of the big rock and the other is halfway up the hill in the north. There are several mosques in all parts of the town, and for the Christians there are two churches, one in Gooty town for the Protestants and another in Gooty Railway Station for the Roman Catholics.

At the foot of the great rock is the European cemetery. Here rested for a short time the body of Sir Thomas Munro, who died at Pattikonda in 1827, when on a farewell tour as Governor of the Presidency, through his beloved Ceded Districts of which he was the first Principal Collector. His remains now lie in the St. Mary's Church in the fort at Madras, but a cenotaph stands at the Gooty cemetery.

At the western end of the principal street is the Munro Choultry constructed to his memory, and in it hangs an engraving of Archer Shee's full length portrait of Munro now in the banqueting hall at Madras.

Only seven miles from Gooty, near Erragudi on the Gooty-Pattikonda Road are the newly discovered inscriptions of Asokan Edicts.

Geography of Hindupur

By

Mr. K. Nanjundappa, B.A.

Location.—Hindupur is situated in 13°49′ N. and 77°29′ E., close to the Penner River. It is a taluk head-quarters in the southern part of Anantapur district. This taluk has to its north Penukonda taluk, west the Mysore state and Madakasira taluk, south the Mysore state, and east the Mysore state and Kadiri taluk.

It is an important railway station on the M. & S. M. Railway running from Bangalore to Guntakal. This town is situated mid-way between Bangalore and Anantapur, the district head-quarters. Lying on the borders of the Mysore state, it serves as a gate-way from the British territory into that state.

Tradition says that it was founded by the Mahratta leader Morari Rao and called after his father whose title was Hindu Rao. It is the largest town in the district and the centre of commerce in its southern part.

Its elevation is 2,068 feet above sea-level and it extends one mile from south to north and three-fourths mile from east to west. The town is surrounded by tanks on all the sides except in the west, where, there is the river Penner flowing towards the north. The river is dry for the most part of the year and is not much utilised for irrigation. Dry crops are grown in the surrounding villages with the help of what little rains they get and with the help of tanks and wells.

Relief of the Town and the River.—The town slopes down from south to north and from east to west and it has a big tank as its southern boundary and all the wet cultivation lies under this tank. The river Penner runs above this tank and by the western side of the town; and a temporary dam has been constructed across the river, right above this tank, which is fed by it at flood-time. The river water thus collected in the tank serves as the main source of supply for cultivation, in spite of the failure of rains in the area. The river Penner takes its origin in the Chennakesava hill, to the western side of the Nandi hills in the Mysore state. It is generally in floods during the rainy

season of the south-west monsoon and the tank is certain to get water whenever the river is in floods. A canal has been dug from the dam into the tank, and the dam and the canal have been maintained by the ryots of the place. There are proposals by the Hindupur Municipal Council to dam the river permanently and it may take some years to come into existence.

Rocks and Soils.—Hindupur taluk is for the most part flat when compared with Madakasira which is hilly and rocky towards the south and more level to the west. There is a small hillock near the high school north of it and stones are quarried here for building purposes. Except for this small hillock, the town and its surroundings form one big plain of red soil.

This soil is found suitable for the growth of dry crops. Even a few inches of rain are enough for one crop as the soil is fairly retentive of moisture.

Weather and Temperature.—The district is indeed one of the driest in the Presidency. The hot season begins early in March and ends suddenly with the arrival of the monsoon usually early in June. The southern taluks of Madakasira and Hindupur which slope gradually from the Mysore plateau are considerably cooler than the northern part of the district. Hindupur town proper is 2068 feet above sea level and hence the place has a cool, temperate and agreeable climate throughout the year.

Rainfall.—During May, June, September and October, we have a few inches of rain and these are spread over about 30 rainy days only in the year, the annual (1931) average rainfall being 19.27 inches. From the above account, it is clear that the climate is very dry and quite agreeable to live in. The district as a whole does not get the full force of either monsoon and the rainfall in consequence is often deficient. It is also frequently irregular. The district is in the rain shadow area. The average for the whole district for the 34 years from 1870-1903 was 23 inches and in the southern taluks Hindupur and Madakasira, where the fall is less scanty than elsewhere, over 24 inches is registered.

Public Health.—The climate being dry and agreeable, the public health also is on a par with it. The major portion of the population is healthy and strong and they are fit for hard manual labour. In former years havocs and fears of plague have done much to deter traders from visiting it. It was in the year 1928-9 when the town was vacated for fear of plague, and from

that year the town is free from plague. The death rate is comparatively low, it being 13.64 per thousand while births were 38.91 in 1933.

Crops.—The soil of the district as a whole except in the northern part of it is, generally, very poor and thin. Agricultural practice varies with the amount of rainfall and with the nature of the soil. The soil being poor, and the rainfall low, the crops are mostly of the dry type ; and wet crops could be raised only with the help of tank and well water.

Ragi and cholam are the staple food grains of the Hindupur and Madakasira taluks and they are cultivated extensively. These crops are only three months in the field and they require little labour and less water. Red-gram, green-gram and horse-gram are also cultivated in some places though not in such large quantities as ragi and cholam.

Paddy and sugarcane are the chief wet crops cultivated on a small scale. These two crops are raised with the help of well irrigation and they require much labour and expenditure and careful attention. Still, the outcome is not at all encouraging, hence the cultivation of sugarcane is slowly falling off and paddy is cultivated mainly for home consumption. The important money crop of the taluk is groundnut which is grown on an extensive scale. Owing to the depression in its trade and the fall in the price of groundnuts, the ryots of the place have suffered much and they are now in debts considerably, their income having fallen while the expenditure remains the same.

A word may be said here about the rotation of crops and mixed sowing of wet and dry crops in the taluk and in the district. The ryots of the place generally have a dry crop immediately after the wet or vice-versa. The practice of the ryots in the taluk is to sow cholam or ragi immediately after the wet crop. The wells help the above system of rotation to a great extent. The ryots are of opinion that " Whatever the character of the season may be, it will almost suit one or more of the crops in the mixture and that if a quick-growing and a slowly maturing crop are mixed, space is economised, since the former is off the ground before the latter has begun to spread." Ragi which is abundantly grown in the taluk and in the neighbourhood of the town, is generally mixed with samai and black-gram ; jonna with groundnut or with gingelly and ragi with yellow-gram. The idea underlying this kind of mixed sowing is to mix the exhausting crops with those that collect nitrogen. It is needless to stress

the importance of these crops for man and beast of the district, especially for the latter which gets ample fodder from these crops. In addition to the above mentioned crops gingelly, chillies, and tobacco are also grown to some extent. A portion of the dry lands are used for cultivating vegetables and all kinds of greens which are supplied to Hindupur town from the neighbouring villages.

Wells and Tanks.—Owing to scanty rain, the whole district is mainly depending on its wells and tanks for its cultivation. Nearly half of the area is irrigated from tanks and wells; and the tanks are rainfed and precarious sources. Both the Penner and its tributary the Chitravati traverse the taluk in the same direction but neither is much utilized for irrigation.

There are two tanks one big and one small, under which the cultivation extends. The small tank is just below the big one at half-a-mile distance and to the east of the town, and it gets its water both from the big tank and from the vast plains extending above the tank area. Again there is a third very big tank below this small tank at nearly one and half miles distance to the north of it and this supplies water for nearly 15 villages and it has thousands of acres of land under its cultivation. The above three tanks seem to lie in a line along a valley where water flows from one tank to another, thus enabling an extensive cultivation to be carried on.

Further there are many wells in the neighbourhood of Hindupur, with the help of which also cultivation is carried on.

Industries.—Agriculture is the chief occupation of India and 50 percent of the population of this place are cultivators. A few important industries also flourish here. Common cloth, gunny bags and blankets are prepared on a large scale and the coarse blankets are sent in thousands for the coolies working in tea and coffee estates of Coorg, Malabar, Mysore state and even Ceylon. This trade in blanket is growing day by day. A community known as Kurubas prepare these blankets and these cumblies are brought to Hindupur market from a distance of more than thirty miles.

There are a few weaver families, who prepare nice cotton and silk saris on a small scale with the help of hand-looms. Further, recently, iron furniture of all types is being prepared locally and the articles are sent to various places in the Presidency. There

FIG 22.

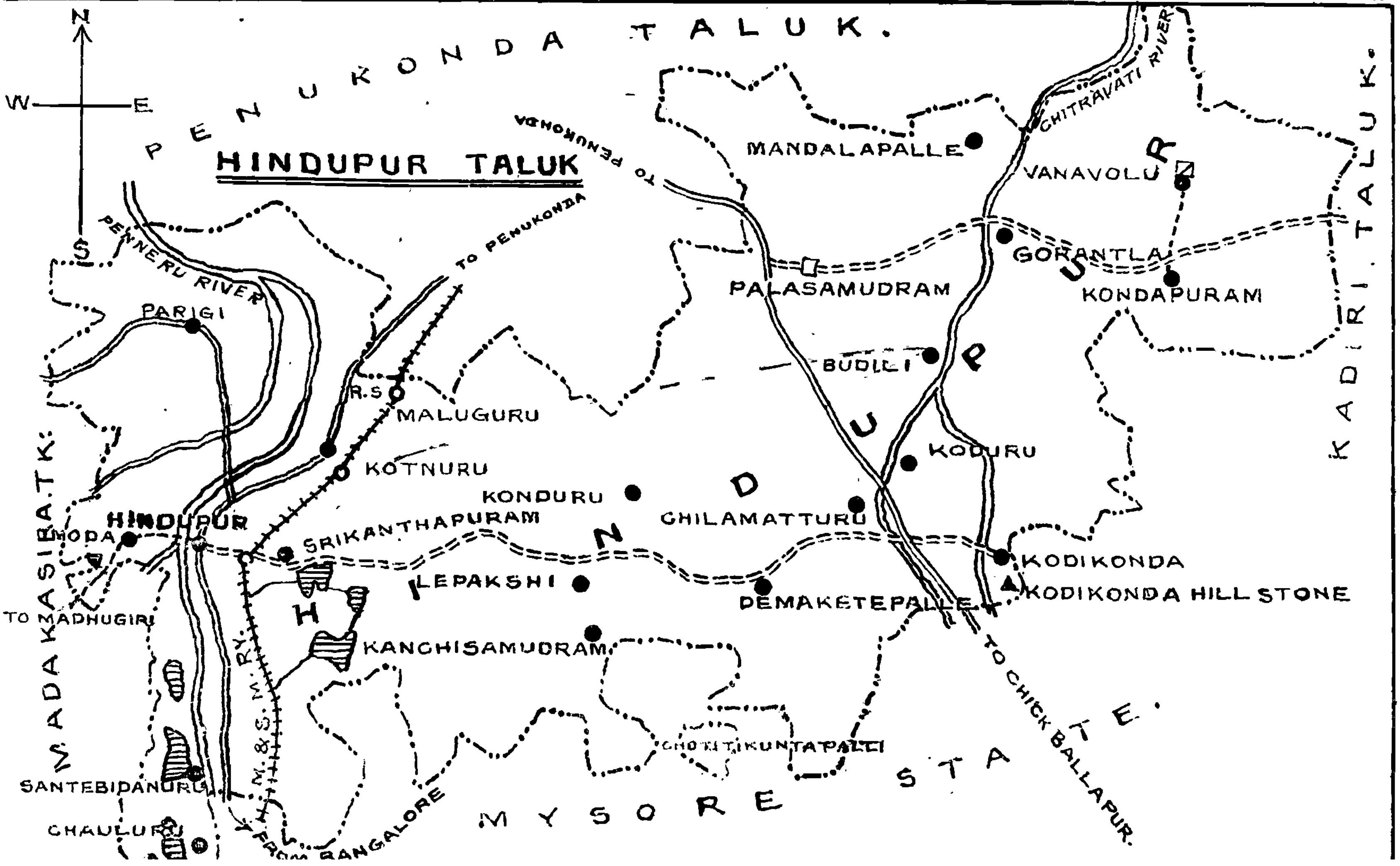
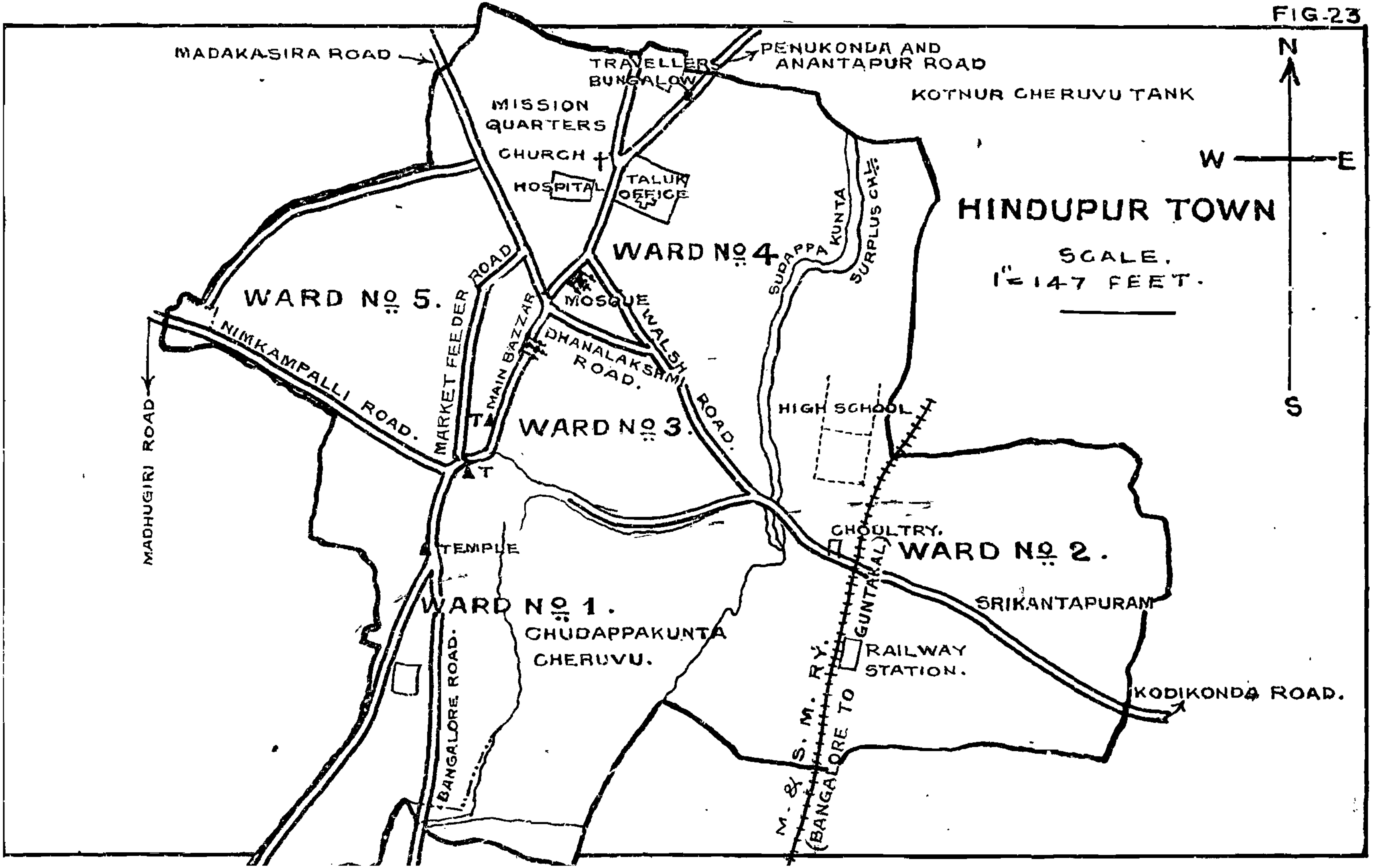

HINDUPUR TALUK
N
S
E
W
PENUKONDA TALUK.
KADIRI TALUK.
MADAKASIRA TK.
MYSORE STATE.
HINDUPUR
CHITRAVATI RIVER
PENNERU RIVER
TO PENUKONDA
TO PENUKONDA
TO MADHUGIRI
FROM BANGALORE
TO CHICK BALLAPUR.
M. & S. M. RY.
R.S
MANDALAPALLE
VANAVOLU
GORANTLA
KONDAPURAM
PALASAMUDRAM
BUDILI
PARIGI
MALUGURU
KOTNURU
KODURU
KONDURU
CHILAMATTURU
HINDUPUR
MODA
SRIKANTHAPURAM
LEPAKSHI
KODIKONDA
KODIKONDA HILL STONE
DEMAKETEPALLE
KANCHISAMUDRAM
SANTEBIDANURU
CHAULURU

FIG. 23



HINDUPUR TOWN
SCALE.
1" = 147 FEET.
N
S
W
E
MADAKASIRA ROAD
PENUKONDA AND ANANTAPUR ROAD
KOTNUR CHERUVU TANK
TRAVELLERS BUNGALOW
MISSION QUARTERS
CHURCH
HOSPITAL
TALUK OFFICE
WARD No 4
SUDAPPA KUNTA
SURPLUS CH.
WARD No 5.
NIMKAMPALLI ROAD.
MADHUGIRI ROAD
MARKET FEEDER ROAD
MAIN BAZZAR
MOSQUE
DHANALAKSHMI ROAD.
WALSH ROAD.
WARD No 3.
HIGH SCHOOL
CHOULTRY.
WARD No 2.
TEMPLE
WARD No 1.
CHUDAPPAKUNTA CHERUVU.
BANGALORE ROAD.
M. & S. M. RY. (BANGALORE TO GUNTAKAL)
RAILWAY STATION.
SRIKANTAPURAM
KODIKONDA ROAD.

FIG. 24.

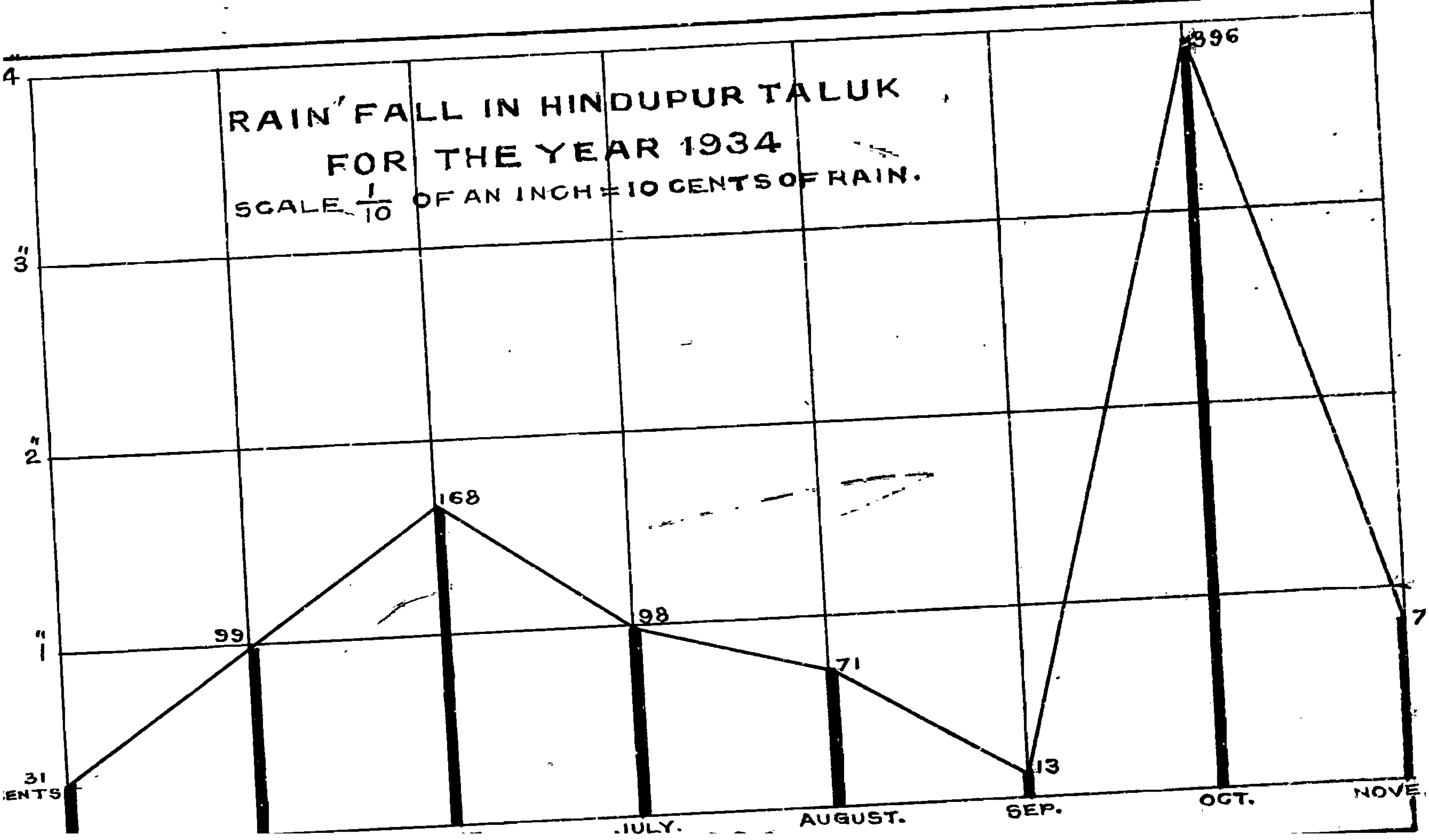
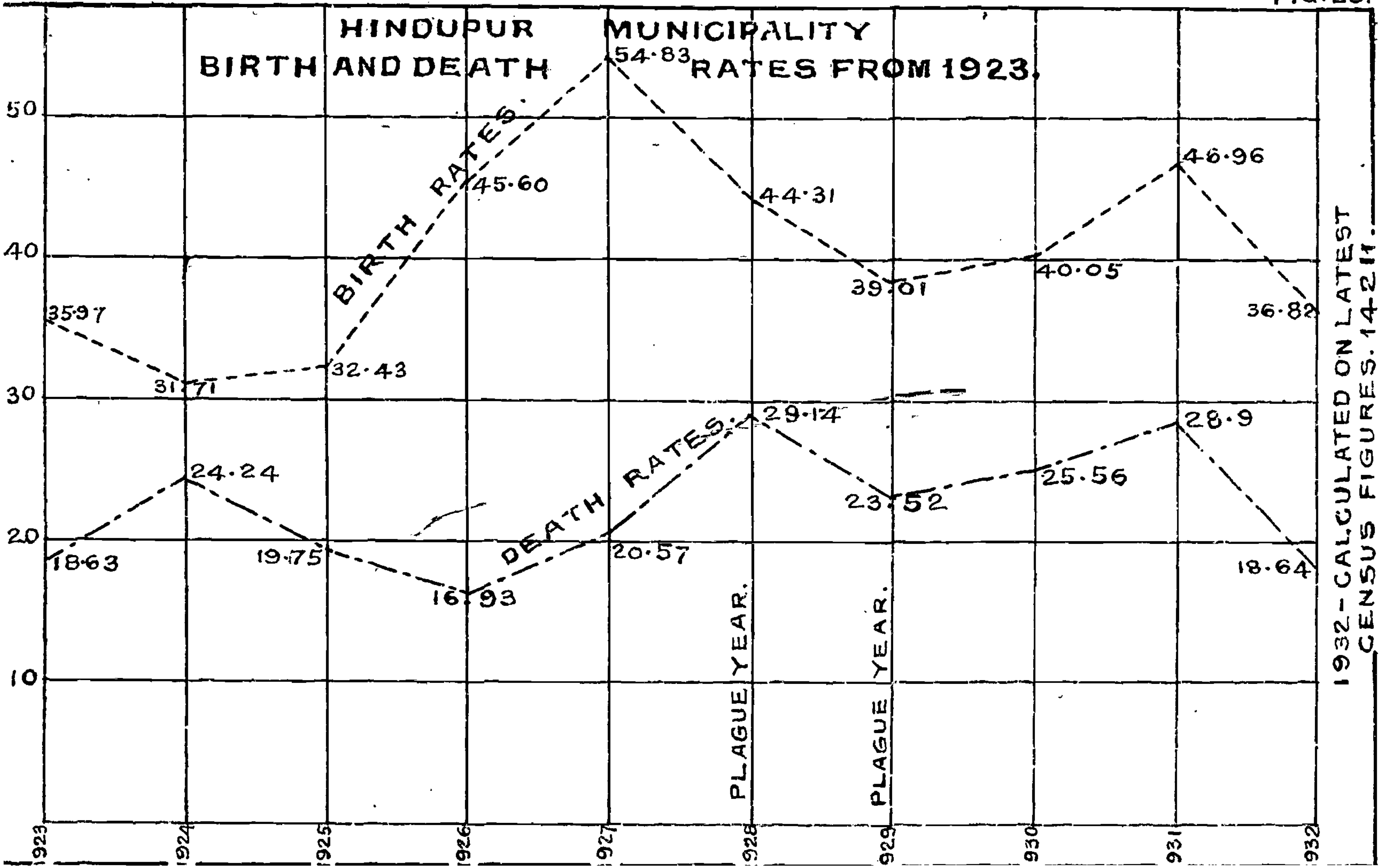

RAIN FALL IN HINDUPUR TALUK
FOR THE YEAR 1934
SCALE 1/10 OF AN INCH = 10 CENTS OF RAIN.
4
3"
2"
1"
31
CENTS
99
168
98
71
13
396
7
JULY.
AUGUST.
SEP.
OCT.
NOVE.

FIG. 25.


HINDUPUR MUNICIPALITY
BIRTH AND DEATH RATES FROM 1923.
BIRTH RATES.
DEATH RATES.
35·97
31·71
32·43
45·60
54·83
44·31
39·01
40·05
46·96
36·82
18·63
24·24
19·75
16·93
20·57
29·14
23·52
25·56
28·9
18·64
PLAGUE YEAR.
PLAGUE YEAR.
50
40
30
20
10
1923
1924
1925
1926
1927
1928
1929
1930
1931
1932
1932 - CALCULATED ON LATEST CENSUS FIGURES. 14211.

are half-a-dozen groundnut shelling factories and rice mills in the town area. Brick-making is another important local industry.

Besides these, there are some industries connected with agriculture such as jaggery preparation which is carried on, on a small scale. During the season, with the help of crushing mills sugar juice is extracted and boiled and the jaggery is sent to the market. At other times, inferior sort of powdered jaggery is obtained and prepared into good jaggery and sent to other markets where there is a large demand for it; and this industry engages hundreds of persons.

Trade. The most important centre of general commerce in the district is Hindupur and it does a large and increasing trade in jaggery, grain, groundnuts, chillies and tamarind. The internal trade of the district is effected by means of weekly markets which are managed by the local boards and the most important are at Hindupur and Tadiparti. Hindupur is important for its commerce both within the district and outside it on a very large scale.

Shandies are held here on Fridays and Tuesdays to which people flock from a distance of nearly thirty-five miles and above, from all parts of the District. Even the traders from Bangalore, Bellary, Guntakal, Tadpatri, Nandyal and Madhugiri, attend the shandy at Hindupur. Besides a large concourse of people, hundreds of double-bullock carts come to the shandy carrying the commodities. Hindupur market collects grain, jaggery and groundnuts from all the surrounding parts far and near and exports them to other places where they are needed. Branches of foreign firms trade extensively in groundnuts only; while about sixty local mandies, carry on trade in grain, jaggery, chillies, groundnuts, tamarind and other commodities.

Coming to imports, Hindupur gets bales of foreign and Indian piece-goods and sells them to the local and neighbouring merchants.

Communication.—The chief reason for the vast and flourishing trade of Hindupur is its central and commanding position it occupies. It is on the Branch of the Southern Maharatta Railway, (opened in 1893) which runs from Guntakal to Bangalore. The military road that connects Bangalore with Hyderabad runs through this place. There are special passenger trains starting from Hindupur early in the morning both for Bangalore and Anantapur and return trains coming to Hindupur at 9 p.m., leaving Bangalore and Anantapur in the evening. The railway authorities issue daily return tickets for a duration of 48 hours from

Hindupur to Bangalore and Dharmavaram and to any intermediate stations. Besides this train service, there are busses plying from Hindupur to Bangalore and Anantapur both in the early morning and in the noon. Other busses run from Hindupur to Madakasira, Penukonda, Pavagada, Kodikonda, Gorantla, Madhugiri and all other surrounding places.

The town is a node where several roads meet. Metalled roads leading from Madakasira and Kodidonda, gravelled roads leading from Bangalore and Penukonda and cart tracks leading from Madhugiri in the Mysore state meet at this place. It is this net work of communications by train, bus and cart that has greatly helped in the developments of its trade and has enabled Hindupur market to be within the easy reach of the far off peasant and merchant.

Population. On account of its enormous trade and its central position, its population has grown to nearly fifteen thousands and it is one of the largest towns in the district. The town is, however, very backward in education, and there are only 116 literate males and 13 literate females per thousand of the population.

The population mainly consists of labourers, merchants and agriculturists. There are facilities for the expansion of the town and as such there is much scope for the construction of new buildings and as a result there would be work for the labouring classes throughout the year. Further the mandies absorb most of the persons as coolies. Next to the labouring class comes the trading class, and the trade importance of the place need not be repeated as it has already received an elaborate treatment elsewhere. Lastly come the agricultural classes who carry on their cultivation in the same old time-honoured fashion with the wooden plough, bamboo-drill and the bullock hoe. Besides these, there are a few engaged in minor industries such as weaving saries, coarse cloth and gunny sack.

The languages commonly spoken in this area are Telugu, Kanarese, and Hindustani. The town being on the Mysore border, the state has influenced the place in its language and manners.

Next, coming to the communities among the labouring classes, the Boyas predominate largely and these are both the main cultivators and the labourers. This community forms the second largest one in the district. Next, come the Vysyas, i.e. the trading class; and these like the Konkanees of South Kanara, are the greatest trading class. The next important community is that of

the Mohammadans, who trade on cattle, skins, bark etc., besides working in the trading shops as coolies, agents and petty clerks. The other important and rich community are the Lingayats, whose main business is trade ; and the entire trade of the place is in the hands of the Vysyas and the Lingayats. Apart from the Hindu and the Muhammadan cummunities, there are some Protestant Christians. Lastly, agriculture, industries and trade of the place have equally contributed to the large growth of the several communities and of the population.

Growth of the town.—Hindupur is a Municipal town with the neighbouring villages, Sreekantapuram and Nimmakammapalli included in its area. This Municipality ranks first in point of finance and administration when compared with the other two municipalities in the district. The town boasts of electric lights.

Formerly, the town grew northwards, towards the taluk office, Police station and the hospital. Now for the last ten years or so, it has a tendency to grow in its eastern direction towards the railway station. Recently the Municipality built its high school on a large tract of waste plain, to the east of the town near the railway station, thus affording scope for the expansion of the town. Several merchants and officers have since purchased house-sites near the Railway Station and are constructing houses. East of the Railway Station, within the Municipal area, a few garden houses have also arisen. It is the nearness to the station, facilities for fresh air and freedom from the din and bustle of the town that induced people to move to the east of the town. It is the high school and the railway station as well as the higher level that have thus contributed to the expansion of the town in the easterly direction. Consequently, site value of the land has gone up in that area.

The Municipal Council has also done a little to help in the expansion of the town in the easterly direction. There are about 50 acres of land just below the small tank which lies between the station and the town, and formerly this area formed wet lands, being cultivated with the help of the tank water. But as it now falls in the centre of the growing town, the Municipality has declared this particular area an Industrial area where no buildings for actual habitation should be built and only factories and other industrial buildings should be erected. Therefore people are compelled to construct houses to the east and west of the Railway Station. Thus all the above circumstances helped in the growth of the town to the east towards the railway station.

A Note on the Communication-Lines of Anantapur District

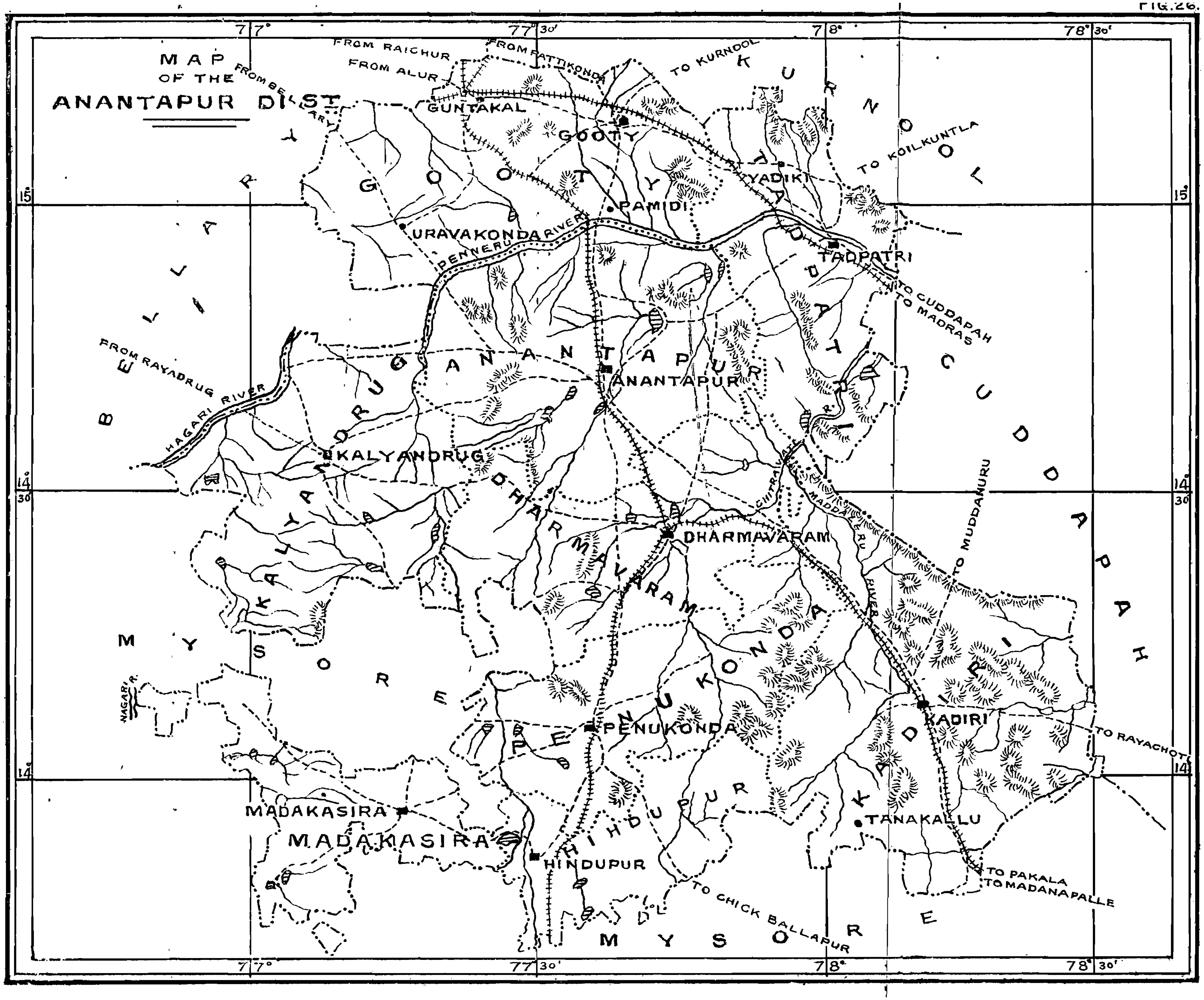
BY

MR. N. SUBRAHMANYAM, M.A., L.T., F.R.G.S.,

In this short note it is necessary to consider at the outset the influence of location and relief on the routes passing through the district of Anantapur. Being situated between the important parts of the Deccan and Southern India, this central area of the Ceded Districts and the heart of Rayalseema, has never in the past been a bone of contention between opposing hosts for any intrinsic value of its own, but has always been a thoroughfare of invading armies from north to south or the other way.

An examination of the relief of the region on a large-scale physical map reveals the fact that the main trend of the feature lines such as the mountains and the valleys is longitudinal in the greater part of the district except in the north, thereby facilitating such a north-to-south movement. Barring the coastal route in the east and the more westerly routes along the Tungabhadra and the Huggri valleys, four distinct north-to-south routes can be traced passing through the district from the south and the south-east and converging and crossing towards the north of it at the nodal centres of Gooty and Guntakal.

Two of these routes are taken by the two roads from Bangalore that run northwards along the parallel valleys of the Penner and its tributary the Chitravathi, which unite a few miles south of Penukonda and continue partly along the latter valley to Anantapur and Gooty. The railway from Bangalore to Anantapur keeps at first to the Penner route, but subsequently crosses over the Penukonda divide along with the road into the Chitravathi valley. It then makes a bend to reach Dharmavaram, while the main road-way keeps a more straight course to Anantapur. Further north at Pamidi after crossing the Penner, the road and the rail part company, the former continuing its northerly course to Gooty while the latter runs in a north-westerly direction to Guntakal Junction. From Gooty the road is carried to Kurnool and thence to Hyderabad (Secunderabad). This is the main north-to-south route that crosses the district, link-


MAP
OF THE
ANANTAPUR DIST.
FROM RAICHUR
FROM PATTIKONDA
FROM ALUR
FROM BELLARY
TO KURNOOL
KURNOOL
GUNTAKAL
GOOTY
YADIKI
TO KOILKUNTLA
PAMIDI
URAVAKONDA
PENNERU RIVER
TADPATRI
TO CUDDAPAH
TO MADRAS
CUDDAPAH
BELLARY
FROM RAYADRUG
HAGARI RIVER
ANANTAPUR
KALYANDRUG
DHARMAVARAM
CHITRAVATI R.
MADDALERU RIVER
TO MUDDANURU
PENUKONDA
KADIRI
TO RAYACHOTI
MYSORE
NAGARI R.
MADAKASIRA
HINDUPUR
TANAKALLU
TO PAKALA
TO MADANAPALLE
TO CHICK BALLAPUR
77°
77° 30'
78°
78° 30'
15°
14° 30'
14°

ing up the states of Mysore and Hyderabad as well as the rest of the Deccan.

Let us take next the other two communication-lines from the south (really the south-east) one by one and not together, as they start from distant parts and do not unite till they reach Gooty and Guntakal in the north of the district, as already stated. Both these are historic routes from the south-east to the north-west and vice versa, used by the Pallavas and the Cholas from the south as well as by the Chalukyas, Rashtrakutas, Mahrattas and the Mahomedans from the north.

The first of these two routes from the south-east is that taken by the road and the railway from Chittoor and Pakala through Damalacheruvu pass, Madanapalle and Kadiri to Anantapur. Notice that here too the railway deviates a little to reach Dharmavaram as in the case of the Guntakal-Bangalore line, while the road runs more directly to Anantapur, showing that probably the importance of Dharmavaram is of more recent origin. From Anantapur the road continues its north-westerly course through Uravakonda to Bellary and Hospet, and thence beyond the Thungabhadra to Bombay. The headquarters of the district thus happens to be an important nodal centre where the Bangalore-Secunderabad trunk road crosses the Madras-Bombay trunk road.

The other route from the south-east is that taken by the Madras—Raichur broad-gauge line of the M. & S. M. Railway, which is continued from the latter place to Bombay. But the roadway does not follow this route right along at the present day owing to the gap in it in the Kodur-Mamandur forested region, which is less frequented now-a-days than the Damalacheruvu-Kadiri route, though historically this route also seems to have been as much used by invading armies as the other. From Cuddappah, however, the road runs along this route, parallel to the railway-line through Tadpatri to Gooty and thence to Guntakal. The latter place is an important nodal centre of railways where not only the Bangalore-Secunderabad (south-to-north) line crosses the Madras-Bombay (south-east to north-west) line, but also the east-to-west metre-gauge line from Masulipatam to Marmagoa crosses the district in its north-western fringe.

The outlying westerly taluks of Madakasira and Kalyanadurg, which are quite away from the railway-line are linked by roads with the rest of the district—the former from Hindupur and Penukonda and the latter from Dharmavaram and Anantapur.

There is regular bus-service not only along most of these roads within the district but also to the adjoining districts of Bellary, Kurnool, Cuddappah and Chittoor. But bus traffic does not seem to be so well developed in this district as in several other districts; and this is no doubt largely due to its comparative poverty and backwardness as well as to the paucity of its population. The bus traffic from Gooty and Tadpatri to Anantapur is, however, larger, as passengers by the broad-gauge line often prefer to save time, by avoiding the circuitous journey via Guntakal.

To sum up, the communication-lines through the district are mainly longitudinal and they converge towards the north at Gooty and Guntakal, whereas they diverge southwards to Bangalore, Chittoor and Madras.

Before closing this short paper, a few observations may be made regarding the condition of the roads in the district. The trunk roads are comparatively recent, dating from 1866 and 1876 when they were constructed as famine relief works. Though the ground is generally hard and good road metal is ordinarily available in most parts, the condition of the roads is not quite satisfactory; and this is due partly to the want of funds and partly to the want of a sufficient supply of water, which is required for consolidating the metal when the road is laid or repaired. The absence of avenue trees and of road-bridges in most parts are other drawbacks, which are traceable to the same two causes mentioned above. It is interesting to note how exactly opposite physical circumstances are responsible for the unsatisfactory condition of the roads in two distant and dissimilar regions like Malabar and Anantapur. The heavy rainfall of the former district results in the badly cut-up roads after the monsoon, while the paucity of rainfall and the insufficiency of water supply accounts for the improperly consolidated roads of Anantapur. The same poor rainfall explains why the general absence of road-bridges does not cause as much inconvenience or dislocation of traffic as it might otherwise cause or as it might cause elsewhere. It is also interesting to note the relatively high proportion of through railway traffic as against the small local traffic; and this is accounted for by the location of the district where two or three important highways of the Peninsula cross it, though the district itself is too poor, backward and thinly populated to be able to support a larger traffic.

News & Notes

With this number the Journal completes the ninth volume. Not only has its size been more than doubled from what it was in the first few years, improvements such as lino-type printing, a larger number of illustrations, finer get-up have been introduced; and of late a special section for teachers, entitled *Geography and Education,* has been included. Members who have not been subscribing for the Journal are requested to do so from the new year (i.e. from 1st April 1935), and thereby support this useful endeavour, so that further improvements can be effected in the coming years. At the request of several members, provision has been made to receive the subscription in instalments of unbroken rupees at the option of the member.

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The present number contains the *Presidential Address* of the *Fifth Geographical Conference* held at Anantapur during the last Christmas week as well as most of the papers read therein—all studies of Anantapur district from various points of view. For want of space a few of these papers have been kept over for publication in the next issue. The Conference was a successful one, being well-attended by teachers from several parts of the Presidency. Some important resolutions were also passed at the Conference which are published under an account of its Proceedings elsewhere.

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In his *Presidential Address* Dr. James H. Cousins made a comprehensive survey of the position of Geography in the educational systems of South India, and made valuable suggestions for improving the position of the subject at all stages of its teaching, besides presenting a lucid and inspiring aspect of it from the higher cultural point of view.

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Diagnosing the causes for the neglect and low position of Geography in the schools of South India, Dr. Cousins traces one of them to the way that students are selected for training in Teachers' Colleges. He says:—"The graduate teacher of other subjects enters the Training College with a guaranteed previous knowledge of his subject. But in Geography alone there is in the

Training College the paradoxical spectacle of prospective teachers being taught the pedagogy of a subject without a previous knowledge of the actual subject—a striking but lamentable example of putting the cart before the horse, and also of giving patronage to the mere bookishness of much of Indian education that good educators deplore. Such a practice would not be tolerated in any other subject of a scientific kind, puts premium on shallowness, and explains though it does not justify the wide-spread but false notion that anyone is fit to teach Geography. * * * Obviously the Training Colleges should take advantage of the Diploma course in the University as an essential preliminary qualification of a teacher undergoing training in Geography, and should take in such diploma-holders irrespective of previous service, guaranteed appointment, or other restrictions, which may or may not be necessary in normal circumstances but should be temporarily waived in the case of a new subject. If sufficient diploma-holders are not available for training in the subject, then others might be chosen under the conditions that they should have handled the subject for a certain minimum time."

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One of the Resolutions at the Anantapur Geographical Conference is an appeal to Headmasters to arrange to provide for the teaching of C-Group Geography in their schools, not only for the sake of pupils who have a natural aptitude and taste for the subject but also for the sake of those pupils who primarily take up science as their first choice but would prefer Geography to History as their second subject. In this connection, we have to refute a fear, unfounded as all such fears are, that the provision of C-Group Geography would involve a very costly equipment. Feeling that this wrong idea would scare away some Headmasters, the Standing Committee of the Association has been asked to prepare a list of minimum equipment, required for teaching C-Group Geography. This list, which has just been prepared, has been included in this number under the Section *"Geography and Education."* Copies of it will be despatched shortly to all Headmasters of High Schools for their information and guidance.

* * * * *

Another Resolution of the Conference makes a similar appeal to Principals of Colleges to provide for the teaching of Geography in the Intermediate Course; and the Standing Committee has prepared a similar list suitable for that course and it is also pub-

lished in this issue. Copies of it will be sent to Principals of Colleges for their information and guidance.

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Thanks to the timely concessions of the railway companies, there was no special need for arranging any excusions as part of the programme of the Conference as in previous years, since almost every teacher that attended the Conference with the Christmas special season ticket visited most of the important places worth visiting in and around the district of Anantapur. It is, however, to be regretted that as these visits were mostly individual and not properly organised so as to derive the best educational values, they were more often treated as mere opportunities for sight-seeing and pilgrimage.

* * * * *

As part of the activities of the Conference at Anantapur, a Refresher Course for elementary school teachers was organised and conducted at Anantapur. Its varied programme included a course of lectures on Geography by Mr. A. K. Balasundaram, District Board Educational Officer of Anantapur. The teachers, over 200 in number, who attended the course were benefitted by his inspiring and useful talks, which were highly practical.

* * * * *

Another adjunct of the Conferences was the Educational Exhibition, in which Geography was fairly well-represented. Among the note-worthy exhibits were some relief maps and picture maps as well as interesting album collections. We wish, however, that more of cheap and home-made apparatus and appliances form the main feature of the Geography section of educational exhibitions than mere copying work, however neat and artistic they may be.

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The next Geographical Conference will most probably meet in Salem in May 1936. Meantime, the Association which will run through its tenth year of life during 1935-36, will have its decennial celebration taking place in Madras sometime in Michaelmas or Christmas of this year. Details about it will be decided in the Working Council and notified to the members.

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In response to requests and inquiries from several quarters, it has been decided to organise another Summer School of Geography in Madras or Saidapet during May 1935. Details regarding the course will be published in due course.

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It is pleasing to note that teachers of Geography who have been handling the subject in Form IV this year have come to appreciate and like the new B-Group syllabus, after studying the hints and comments regarding it in an earlier number of the Journal and carrying on their teaching accordingly. A few, however, while accepting it as a carefully prepared, useful and purposeful syllabus, still feel that it is somewhat heavy. The remedy is in their own hands, to drop some details in such topics that they consider could conveniently be pruned. The running of practical work and general principles of Geography through a course of Indian Geography and the outline study of a few typical regions of the World to give the world outlook is the only convenient and workable compromise, if the Regional Study of World Geography by all pupils in the V and VI forms is made impossible by the present scheme.

* * * * *

It has been generally felt that the lower school (including the middle school) has not yet been touched by the leaven of new ideas and methods regarding the teaching of Geography; and the reason for this state of affairs is to some extent attributed to the neglect of the subject in the training schools. Without accepting the truth of this statement as unproven, it is worth while to probe the matter in a constructive way, and find out how far it is possible for training schools to contribute to the improvement of Geography teaching in the lower and middle schools. We are therefore, getting an experienced Headmaster of a Secondary Training School who is himself technically qualified in the subject to discuss the topic from his inner knowledge of the conditions and circumstances obtaining in such institutions.

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We are sorry to have omitted to acknowledge in our last issue that the block of the map of railways in South India published in it was kindly lent by the Editor of the South Indian Teacher. Owing to hurry and oversight, the receipt of that Journal has not been acknowledged.

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We close this number with an appeal to all members that each of them should try to secure at least one more member, so that the strength of the Association may be doubled by the time we have our First Decennial Celebration.

The Madras Geographical Association

PROCEEDINGS OF THE V GEOGRAPHICAL CONFERENCE ANANTAPUR SESSION: DECEMBER 1934.

The Fifth Geographical Conference of the Association commenced its sittings on the afternoon of Monday the 24th December 1934 at the Ceded Districts College Hall, Anantapur under the Presidency of Dr. James H. Cousins, M.A., D. Litt, Principal, Theosophical College, Madanapalle.

Besides the following members of the Association, there was a large gathering of visitors:—Mr. A. K. Balasundaram (Anantapur), Mr. C. Ranganatha Iyengar (Gooty), Mr. Lakshmipathi (Uravakonda), Mr. G. Sesha Sarma (Anantapur), Mr. M. V. Srinivasan (Penukonda), Mr. M. Venkatasubbiah (Anantapur), Mr. K. N. Pasupathi Iyer (Kurnool), Mr. N. Raghavachari (Anantapur), Mr. N. Ramasubbier (Anantapur), Mr. T. Abdur Rahman (Kadiri), Mr. N. Subrahmanyam (Madras), Mr. Abdul Khader (Vellore), Mr. M. S. Sabhesan (Madras), Mr. S. T. Ramanuja Iyengar (Trichinopoly), Mr. K. S. Chandrasekharan (Madras), Mr. V. Koprasa Char (Gooty), Mr. R. Srinivasan (Madras), Mr. T. S. Suryanarayana (Madras), Mr. R. Seshagiri Rao (Ellore), Mr. G. Mahadeva Iyer (Madras), Mr. A. R. Srinivasa Iyer (Madras), and Mr. P. Sridhara Rao (Madras).

After the Welcome Address was delivered by Prof. A. V. Venkatarama Ayyar of the Ceded Districts College, Dr. J. H. Cousins was installed in the Presidential Chair and delivered the Presidential Address (published elsewhere). The opening session closed after the announcement of the detailed programme for the next two days.

At 8 a.m., on Tuesday the 25th December, the second session was held, when about half a dozen papers on various aspects of the Geography of Anantapur District were read and discussed.

At the concluding session which was held at 8 a.m., on Wednesday the 26th December three more papers were read and the remaining ones were taken as read for want of time. The following five resolutions were also passed unanimously:—

(1) This Conference, while deprecating frequent changes in the determination of the knowledge content of the S. S. L. C.

Scheme, requests the Director of Public Instruction to give Geography its proper place in the next revision of the S. S. L. C. Scheme.

(2) This Conference urges on the Principals of Colleges in the Presidency to provide for the teaching of Geography as an option under part III, Group 1 of the Intermediate Course.

(3) This Conference urges on Headmasters of schools to make provision from the next school year for the teaching of Geography as a C-Group subject of study under the 1934 S. S. L. C. Scheme.

(4) This Conference requests the Standing Committee of the Madras Geographical Association to draw up at an early date and issue for the guidance of heads of schools and colleges a list of minimum requirements by way of equipment for the teaching of Geography in the High Schools and Colleges of the Presidency.

(5) This Conference conveys its thanks to the Surveyor-General to the Government of India for the concession granted by him of half-rates to educational institutions for single copies of topographical maps of the Government of India, and requests him to extend the concession in the interest of map-study in schools to the purchase of at least a dozen maps of each kind.

After the concluding speech of the President, vote of thanks was proposed to the President, to the authors of the several papers and to the visitors who responded to the invitation. The Conference then came to a close.

Reviews

An Introduction to Mapwork and Practical Geography. By John Bygott. (University Tutorial Press, Ltd., London). Price 8sh. 6d.

This is a text-book on modern lines, providing an introductory course in map-reading and practical geography, suitable for use in the upper forms of schools (for C-group Geography) and for the Intermediate Course in Geography.

Part I, which deals in 13 chapters with Mapwork, takes the student through preliminaries of Map-reading to the study of Ordnance maps, distributional maps and the graphical representation of geographical statistics, and the study of weather and climate maps, including a clear exposition of map-projections in three chapters. A notable feature in this part is the inclusion of portions of actual Ordnance Survey maps. The weather map is also dealt with in great detail with a reproduction and discussion of many typical examples.

The problem of map-making is approached in a simple and clear manner, so that the students can easily see how survey work supplies the data for the map, and why particular projections are selected for particular purposes. Simple graphical methods for constructing important projections are carefully explained.

Part II deals with Surveying in four chapters including contouring, while the last chapter in it treats of the interpretation of Geological Maps.

The volume is illustrated with a number of important and necessary diagrams ; and many useful and suggestive questions and exercises have been appended at the end.

The book is comprehensive, bringing within its compass material that is usually treated in two or three different volumes. In fact, it fills a gap, and can be recommended for use as an introductory book by the University Diploma Students, as a text-book by the Intermediate students and as a reference book in the High School.

Practical Map Books : Book 4—North and South America. By S. J. B. Whybrow (J. M. Dent & Sons, London). Price 10d.

This is the fourth book of the series of which the first three were already reviewed in earlier numbers of the Journal. Like the others, this book also is intended to supplement the text-book and the atlas rather than to take their place. The working out of

the given exercises on the blank maps is calculated to ensure a knowledge of topographical accuracy, besides helping the study of familiar material from fresh points of view. Starting with the study of the position and physical features of the two continents, the exercises take the student through climate, products and natural regions, and then finish up with a study of density of population and trade. The use of this series of books will prevent parroting in the study of Geography, since the facts will be fixed in the mind as the exercises are being worked out.

Geography of Madras Presidency (in Tamil). By Mr. C. Venkatesan (Educational Publishing Co., Madras). Price 6 annas.

This is an altogether original book on refreshingly new lines away from the beaten track of over-logical and over-systematised Geography that is usually pumped into the little ones in this part of the world. A chatty little book, the device has here been adopted of bringing together merchants from the different parts of South India, who discuss at the host's residence in Madras the varying products, life and conditions in their respective homes which happen to be distinct regions. The language is simple ; and the dialogue method which has been followed is well calculated to rouse the curiosity and interest of the children. It is specially pleasing to note the emphasis on food, dress and other aspects of social life of the people in the different regions.

The title of the book may well have been "*Geography of South India*" rather than of *Madras Presidency* inasmuch as the Indian States of Mysore, Travancore etc., have also been included for a fairly full treatment. The book is, however, easily capable of desirable improvements such as a more equal and even treatment of the different sub-regions, the avoidance of a few inaccuracies, the adoption of wider regional instead of narrow district heads of classification, and a better set of pictures, some of which merely smudge the paper and one of which at least, the Madras Harbour, is quite wrong.

We congratulate the author on having had the courage and the imagination to strike an impressive new line of treatment and produced a book which is really interesting to children.

Indian Culture (Journal of the Indian Research Institute, Calcutta). Published by Satis Chandra Seal. Volume I, Parts 1, 2 and 3. Inland subscription Rs. 6: foreign subscription 10sh.

We have great pleasure in welcoming this Quarterly Journal of the Indian Research Institute of Calcutta. The first three num-

bers before us show that this Journal attempts to bring within the purview of its studies and researches all topics relating to Indian culture in the most comprehensive sense of the term, including history, geography, art, architecture, iconography, epigraphy, numismatics, religion, literature, philosophy, ethnology, anthropology, folklore etc. It is gratifying to note that the papers are all of a high order, being treated in a scholarly way by persons who are masters in their respective spheres of study and fields of research.

In our Journal attention has naturally to be drawn to the "Geography of Kautilya" by H. V. Trivedi, in which an attempt has been made at reconstructing some bits of Ancient Indian Geography by a discussion bearing on the identification of geographical places and products (pearls, gems and spices), mentioned in the 11th chapter of the 2nd book of Kautilya's Arthasastra. Several of the other articles, which are chiefly historical, throw sidelights highly helpful in the reconstruction of Ancient Indian Geography.

Report of the Department of Industries, Madras for the year ending 31st March 1934. (Superintendent, Government Press, Madras). Price 1 Re. 2 as.

This Report of the Madras Industries Department gives a fairly full account of its varied activities during the period under report. It is interesting to find that in spite of the continued and general economic depression the number of new industrial undertakings registered during the year was the highest recorded. Of these, three were cotton mills, five ginning factories, four sugar factories, one steel rolling mill and three mining companies. The supply of electric energy from Pykara accounts for the flotation of the three cotton mills and five ginning factories with their head offices at Coimbatore. The industrial possibilities of the area adjacent to Mettur are under consideration. There was an increase in the output of manganese and barytes while that of magnesite and mica showed a reduction. Exports of manganese and mica rose, the value of exports of the former to the United Kingdom being more than double that of the previous year.

As a result of the preferences granted by the Ottawa Trade Agreement, trade with the United Kingdom improved during the year, the total export to that country from this Presidency having increased by Rs. 100 lakhs. The products that chiefly contributed to the increase in the export trade were cow-hides, raw cotton, sheep-skins, tobacco, coir (manufactured), castor-seed, ground-

nuts and rubber. In order to take full advantage of the high tariff on sugar imports, the department assists the development of the sugar industry in several ways. Altogether the Report is interesting as showing the various ways by which official help is being rendered for the growing industries of the province.

Wall Map of Villupuram Taluk and Wall Map of Kallakurichi Taluk (in Tamil): By K. Narayanaswami Ayyar, Municipal High School, Villupuram.

These two wall maps have been prepared by an experienced teacher of Geography, who is already the author of some local geography books on practical lines. Excepting the Taluk Maps prepared by the Madras Survey Department, which are in English, there are at present no maps for the two taluks, as for most other taluks, prepared in the mother-tongue and suitable for elementary schools. They, therefore, fill a gap and satisfy a felt need. The taluk areas are divided into firkas, shown in different colours; and only important place-names have been included, written in bold type. The chief hills, tanks and rivers have been marked as well as communication-lines; and of the latter not only roads and railways but also metalled roads and country tracks have been differentiated. The map of Kallakurichi Taluk, which is apparently a later production, shows improvements on that of Villupuram, showing more features, physical and human, of which the representation of forest areas needs special mention. The lithographers are to be congratulated on the bold and neat lettering and proper binding, mounted on cloth with rollers. It is hoped that the Board authorities in the district of South Arcot will arrange to supply these maps to their elementary schools in the two taluks, and that private managers also will encourage the use of them in their schools.

Relief Model of the Southern Continents: By M. S. Paul, Board Middle School, Udayarpalayam.

Mr. Paul, who has exhibited similar models in various educational exhibitions and obtained credit in the shape of certificates and medals, has sent us this relief model which looks quite neat and well-prepared except for a few little inaccuracies of relief, which it is hoped will be avoided in future models. He is prepared to supply any relief models required at very cheap prices.

Books and Journals Received

Practical Map-books: Book 4—*North and South America*: By S. J. B. Whybrow.

Geography of the Madras Presidency (Tamil): By C. Venkatesan.

Relief Model Map of the Southern Continents: By M. S. Paul.

Wall Map of Villupuram Taluk: By K. Narayanaswami Ayyar.

Wall Map of Kallakurichi Taluk: By K. Narayanaswami Ayyar.

South Indian Teacher: August to December, 1934.

Kalaimagal: November and December 1934, and January 1935.

The Educational Review: November and December 1934, and January 1935.

The Geographical Journal: November and December 1934.

Educational India: November and December 1934.

The Scottish Geographical Magazine: November 1934.

Indian Culture: July and October 1934, and January 1935.

Travaux de l'Institut Geomorphologique: Books VI to XI, 1933 and 1934.

Bibliografia Vostoka: Books I to VI, 1932 to 1934.

The Indian Educator: December 1934.

Our Home Magazine: December 1934.

Report of the Madras Department of Industries for the year ending 31st March 1934.

T. V. Chellappa Sastry & Sons,

Printers, Publishers, Book-Sellers. 1-1, Sembudoss Street, Madras.

By T. V. Chellappa Sastry, B.A., L.T.

Madras Presidency Geography, V Standard				As. 7
Tamil Text-Book of Geography Book	I	for Form	I	.. 10
Do.	Do. II		II	.. 10
Do.	Do. III		III	.. 10
B. V. Narasinga Rao	I		I	.. 10
Do.	II		II	.. 10
Do.	III		III	.. 10
District Geography Madras, Chengleput, South Arcot, North Arcot, Tanjore, Trichy, Madura, Tinnevelly, Salem, Coimbatore, Chittore, Nellore, Cuddapah, Bellary, Anantapur, Kurnool, W. Godavery each.				.. 4
District Map Drawing Book for IV Standard				.. 2
Do.	V	Do.		.. 4
Do.	Form I			.. 4½
Do.	Do. II			.. 5
Do.	Do. IV			.. 6

Plain Map Drawing Books are also available.

The above publications can be had also in Tamil, Telugu and Malayalam.

Apply for illustrated catalogue.

LIST OF MINIMUM EQUIPMENT FOR 'C' GROUP GEOGRAPHY FOR THE S. S. L. C. COURSE

(Prepared by the Standing Committee of the Madras Geographical Association.)

Name of the Book.	Name of the Author.	Publishers.	Rs.	As.	Ps.	£.	sh.	d.
REFERENCE BOOKS.								
A Groundwork of Modern Geography	A. Wilmore.	Bell and Sons. (Indian Agents: Longmans.)				0	7	6
Physical Geography	Lake.	Cambridge University Press. (Indian Agents: Macmillan.)				0	7	6
Human Geography for Secondary Schools, Books II and III.	Fairgrieve and Young.	George Philip and Son. (Indian Agents: Longmans.)				0	6	6
Descriptive Geography from Original Sources (6 Books: one book for each Continent)	Herbertson (A. J. & F. D.)	A. and C. Black. (Indian Agents: Macmillan.)				0	15	0
ANY TWO OF THE FOLLOWING TEXT BOOKS:								
A Geography of the World (Two parts)	N. Subrahmanyam.	Indian Publishing House.	3	0	0			
The World (Indian Edition)	L. Dudley Stamp.	Longmans Green and Co.				0	5	0
Our World: A Human Geography	Cameron Morrison.	Macmillan and Co.				0	4	0
New Regional Geographies, Book IV. (The World)	Leonard Brooks.	University of London Press, (Indian Agents: Longmans.)				0	7	6
METHOD BOOKS.								
A Handbook for Geography Teachers	D. M. Forsaith.	Methuen and Co.				0	4	0
Geography in School.	James Fairgrieve.	University of London Press, (Indian Agents: Longmans.)				0	7	6
Principles and Practice of Geography Teaching	Barnard.	University Tutorial Press, (Indian Agents: Oxford University Press)				0	4	6
		C.O.	3	0	0	3	9	0

Name of the Book.	Name of the Author.	Publishers	Rs.	As.	Ps.	£.	sh.	d.
		B.F.	3	0	0	3	9	0
PRACTICAL GEOGRAPHY BOOKS								
Surveying for Schools and Scouts.	Richardson.	Philip and Son, (Indian Agents: Longmans.)				0	2	6
Experimental and Open Air Geography.	A. Wilmore.	Bell and Sons, (Indian Agents: Longmans)				0	1	9
A Classbook of Practical Geography.	Fairgrieve and Young.	Philiph & Son, (Indian Agents: Longmans Green & Co.)				0	2	6
Exercises in Ordnance Survey Maps.	C. H. Cox.	Bell and Sons, (Indian Agents: Longmans)				0	2	0
Outdoor Geography.	Hatch.	Blackie & Son.				0	2	3
Educative Geography	Haddon.	G. W. Bacon & Co., (Indian Agents: Blackie & Son.)				0	1	6
ATLASES.								
Oxford Advanced Atlas.	Bartholomew.	Oxford University Press.				0	10	6
Atlas of Economic Geography.	Bartholomew, Lyde and Shackleton.	Oxford University Press.				0	8	6
MAPS.								
Topographical—								
1" Map of the Survey of India—12 copies of the Map of the Home Region		The Map Records and Issue Office, 13, Wood Street, Calcutta.	18	0	0			
Colour Layered Edition. of ¼" Map of the Home Region.		The Map Records and Issue Office, 13, Wood Street, Calcutta.	3	0	0			
		C.O.	24	0	0	5	0	6

Name of the Book.	Publishers	Rs. As. Ps.	£. sh. d.
	B.F.	24 0 0	5 0 6
GEOGRAPHICAL.			
Philips' Comparative Series of Smaller School Maps:— 6 maps—One map for each of the continents.	Geo. Philip & Son. Indian Agents: Longmans.		
Philips' Comparative Series of Large School Maps:—			1 10 0
The World on Mollweide's Protection	Do. Do.		1 2 6
Indian Empire and Ceylon.	Do. Do.		0 16 6
Philips' 12″ Globe: Physical (Contour) Edition.	Do. Do.	30 0 0	
SURVEYING INSTRUMENTS.			
For chain survey only: All the requirements can be locally made from hints and suggestions given in Hatch's *Outdoor Geography*, Haddon's *Educative Geography* and other books on Practical Geography. Three sets may be needed. Provision may be made for		30 0 0	
METEOROLOGICAL INSTRUMENTS.	**DEALERS.**		
Maximum and Minimum Thermometer.	Andhra Scientific Co., Masulipatam.	4 8 0	
Rain Guage.	May be locally made at about	5 0 0	
Mercury Barometer.	Do. Do.	25 0 0	
Wind-vane	Do. Do.	3 8 0	
		122 0 0	8 9 6

The total amount is well within 225 rupees.

N.B.—Several schools may not have to expend so much if existing equipment is taken into account.

LIST OF MINIMUM EQUIPMENT [illegible]

(Prepared by the Standing Committee of the Madras Geographical Association.)

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